

VOLUME XCII

NUMBER ONE

THE NATIONAL GEOGRAPHIC MAGAZINE

JULY, 1947

The World in Your Garden

With 10 Illustrations
24 Paintings

W. H. CAMP
ELSE BOSTELMANN

Drums to Dynamos on the Mohawk

With 24 Illustrations and Map FREDERICK G. VOSBURGH
19 Natural Color Photographs B. ANTHONY STEWART

British Castles, History in Stone

16 Etchings

NORMAN WILKINSON

Adventures with the Survey Navy

With 18 Illustrations and Map

IRVING JOHNSON

Forty Pages of Illustrations in Color

PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
WASHINGTON, D.C.

\$5.00 A YEAR

50c THE COPY



The World in Your Garden

By W. H. CAMP

The New York Botanical Garden

With 24 Paintings by Else Bostelmann

THE WAY had been long and over passes more than two miles in the air. Down to the lowlands we slithered and slipped on precipitous trails to become involved in seemingly interminable miles of mud, some of it almost saddle-girth deep.

Ahead through the mists loomed the goal, the somber ridges of the Cordillera Cutucú, one of the easternmost wrinkles of the Ecuadorian Andes, which lies at the margin of the great Amazonian plain. Only one real obstacle lay ahead. And that was the Jivaro Indians.

Only a few years before, in the course of a single morning, one group had made "museum specimens" of more than twenty gold miners who had been trespassing on their territory, and I was not certain if it would be this group with which I would make contact, or possibly a more friendly one.

I had supposed that head shrinking was no longer practiced by these Indians, but after seeing a rather fresh relic with a magnificent set of red mustaches, I seriously pondered removing my own natural facial adornment. Personally, I was in no mood to let some Jivaro try his hand at an art job on me.*

Love of Gardens an "Open Sesame"

I was received into the house of the chief of the region with the customary aloof courtesy. After some hours of circuitous and seemingly fruitless palaver, the old chief and I wandered out into his garden and, as best we could in the phrases we had in common, talked of the plants he was growing there.

The head-hunting Jivaros are excellent gardeners. Among the plants in the chief's

garden were four which are commonly grown in parts of the United States. One of these is the papaya. The Jivaros do not use the ripe fruit; instead, they cook the green fruit.

Another plant which, by its trailing vine and bright-blue flowers would be recognized by anybody as a close relative of the garden morning glory (page 52), the old chief called *ingi*. Although we seldom see its flowers here in the North, we regularly raise it in our own gardens under the name of sweet potato.

The other two we know only as ornamentals. The Jivaros grow the canna for food and the angels trumpet as the source of a narcotic drug (page 50).

Apparently I was the first plant explorer the old chief had ever seen, and when he finally understood that all I really wanted was to study the plants of his territory, the barriers were let down. After that talk about the plants in his garden I lived with that group in perfect harmony for as long as I stayed in the region. Being gardeners, we had something in common.

Another time I walked in a garden at Skagway, Alaska, at 10 p. m., with the sun still shining, admiring such things as Mexican dahlias, Mediterranean sweet peas, African pelargoniums, European pansies, and South American petunias. All the while the grower and I—strangers an hour before—were discussing the peculiar problems he had encountered (and solved) in growing these foreign things in that far-northern garden.

* See "Over Trail and Through Jungle in Ecuador," by H. E. Anthony, *National Geographic Magazine*, October, 1921.



International

From Far-off Japan Came the Easter Lily

Bulbs for winter forcing in pots have been shipped in quantity to northern florists from Bermuda, leading to another common name, Bermuda lily. Large stocks of this and closely related varieties are now also grown in the Southern States and the Pacific Northwest. This sweet-scented display is in Cypress Gardens, Florida.

So widespread are the areas from which our decorative plants have come that when we walk along our garden paths it is almost like taking an extensive tour. In fact, with just a little planning, even with no more than a small backyard plot, anyone can say, "The world is in my garden."

Beginnings of Ornamental Gardening

The first cultivation of plants was for food. For thousands of years previously, the wild grains, fruits, bulbs, roots, and herbs had been utilized. When cultivation began—probably not less than 20,000 years ago—these were moved into the first gardens. And so, such succulent and quite edible things of the Mediterranean and western Asia regions as the tulip, hyacinth, narcissus, and Star-of-Bethlehem took their places, as bulbous crops, beside the nutritionally similar onion and garlic.

Before the advent of maize (Indian corn) into Mexico—an event of prehistoric times—the roots of the several kinds of dahlias (page 54) were an important source of starchy food and so were grown as a crop. Potatoes, now commonly grown in Mexico as a starch source, seem to have been introduced there from South America by the Spaniards.

One of the prettiest sights I have ever seen was a little dusky-skinned Mexican girl coming out of the hills with an armload of brightly colored dahlias. In older times she would have been returning with the roots instead.

Also, it is indeed difficult for us to realize that so magnificent a sight as the water-lily called East Indian lotus even today stirs the salivary glands of many Asiatics more than it does their esthetic senses (page 41). The large rhizomes, or rootstalks, with their curious air passages, as well as the nutlike seeds are common items in Chinese groceries in our larger cities.

In medieval Europe a housewife out gathering a basket of violets, primroses, or similar flowers probably was not fashioning a pretty bouquet. More likely she was getting the materials together for a tasty salad, or "sallet," as she would have called it. Once the dietitians tell us that these common flowers are richer in vitamins than many of the pallid things we serve as salads, they will again become popular food.

With the invention of the sickle and the plow there was a great increase in the growing of the grains, agriculturally the most efficient producers of basic food materials and also the most easily stored. This led to a reduction in the effort spent on the cultivation of bulbous food sources such as the tulip and hyacinth. Apparently the same thing happened to the

dahlia in Mexico when maize was introduced from South America.

But man is a sentimental creature. How often people have brought me plants which were diseased, physiologically senescent, straggly, and asked me what to do for them. Perhaps it would be no more than a common geranium, better replaced by one of the newer, more colorful, and more floriferous kinds. But no, the owners would not throw it away and get a new plant, for they had been tending it for a half-dozen years or more.

And so it must have been difficult for man to discard those plants he had been carefully tending for thousands of years in his vegetable gardens. Also, they could always be used as emergency foods in case of a failure of the grain crop.

Man also is fundamentally a religious creature, much given to watching for signs and portents. Thus he early noted that certain kinds of plants came into bloom at regular times. To primitive man this bordered on the supernatural, and so the flowering period of various choice kinds marked the periods when he worshiped particular deities.

These floral calendars are a feature of many primitive peoples. Although considerably changed, these religious ceremonies still persist in our modern cherryblossom, tulip, rose, and chrysanthemum festivals.

Thus, often starting out as foods, many plants were retained because of sentiment, or because they had become associated with religious ceremonies. In this way began the cultivation of flowers.

Flowers for Medicines

Although some garden flowers were first cultivated as foods, others were first domesticated for their medicinal properties. In the paintings which follow, several of these are featured. Foxglove originally was used as a source of medicines, notably heart ailments (as it still is), and sweet scabious as a cure for the itch. Both were in herb and medicinal gardens long before they were thought of as ornamentals (page 21).

The Christmas-rose (*Helleborus niger*), now prized for its early flowers, was originally grown for its roots, which contain a powerful purgative. The monkshood, with its spikes of curious flowers, so common in our gardens, already in medieval times was a source of a series of potent drugs and poisons.

The roots of elecampane, a species of *Inula* often seen in herbaceous borders, once were the base of a much-used tonic. As some indication of how long this plant has been cultivated, the present common name, elecampane,



Arthur Hease (from International)

Flowers from an Electric Garden Plug in Anywhere

At the International Flower Show in Grand Central Palace, New York, a novel exhibit showed artificial blossoms that give light. Used as a bedside lamp, this bulb glows with the colors of a rose.

is a corruption of the Roman name for it, *malva campana*.

In the southern Appalachians, where Elizabethan English words still persist, I once came to a cabin beside which was an old-fashioned herb garden. The old "yarbwoman" was quite willing to tell me of the virtues of the several plants.

One was the "feverfuge," which was guaranteed to "chase away the fevers." In Old English, the same plant is mentioned as "feberfuge," a corruption of the Latin word *febrifuga*. Today we list the plant as "feverfew," or *Chrysanthemum parthenium*.

In mentioning a species of chrysanthemum, one is reminded of another of the same genus, the common garden pyrethrum (*Chrysanthemum*

coccineum). The dried flower heads of a closely related form (*Chrysanthemum cinerariifolium*) are the source of the insecticide, pyrethrum, now commonly used in gardens.

It seems, however, that pyrethrum was not first used as a control for garden pests. Rubbed on fresh, or preferably applied as a powder to the skin and clothes, it seems to have been used as a control measure for such things as body lice and fleas.

In the South American Andes I found the Quechua-speaking Cholos using other plants, not too distantly related to the pyrethrum, as a cure for "nervousness" in infants. Anyone who has lived with these people knows that much of this infant "nervousness" is due to the bitings of insect pests.

I therefore suspect that man's interest in chrysanthemums as a source of insect powders may go back much farther than his appreciation of them as garden decoratives.

And I suppose that even the little wild pansy, called in England and sometimes here heartsease (page 19), might be classed as a medicinal plant of sorts, for in the olden days a decoction of it was administered to cure the pangs of love. Our modern English name "pansy" comes from the French word *pensée*, and, as the old poem indicates, the malady might become serious:

Why so pensive, little maid?
Prishee, why so pale?

And if the little lady also were having the "vapors" and going into a decline over the affair, she would be given in addition an extract of rue, used as a tonic stimulant. Although the younger generation is now some-

what more philosophical about such matters of the heart, we still grow heartsense and rue in our gardens.

There were other ways in which our flowers came into gardens. In those days when bathing was not too convenient, a lady had to disguise the fact as well as possible. So the somewhat sweet-scented orris-root was used both as a perfume and as a dusting powder. The word "orris" is a corruption of *iris*, and the source of this material is the powdered root of the Florentine iris, one of the ancestors of the more common of our modern garden groups of this genus.

A list of flowers which came into gardens first as the sources of perfumes and toilet waters—again as substitutes for soap and water—would be a long one. There is a legend that a certain ancient oriental potentate ordered that his bath water always have steeped in it a mass of rose petals. However, he noted that there was a slight oily scum on the water. Disliking this apparent contamination, he ordered that it be skimmed off; whereupon it was discovered that this oily substance was the real source of the rose odor.

While this legend may be apocryphal, the fact remains that the toilet water used by polite ladies for their occasional sponge baths until bathtub bathing became fashionable was no more than an infusion of flowers in water.

But things really were not so bad as they might seem, for almost every region has some plant which, when rubbed up in water, makes a sort of soapy lather. For example, the people of Europe and Asia Minor had several species of *Saponaria*, or soapwort. After the invention of soapmaking from an extract of



West-Indian-Style Wall Inlay Work

He Repairs an Inlay of the Diwan-i-Khas at Delhi, India

Because of man's dependence on plants and his love of the flowers they bear, he has turned to them for inspiration in many ways. Ancient wall decorations evolved into our modern figured wallpaper (page 8). First used around temple doors, these ornaments later became stylized when cut into stone and placed on the columns which support structures.

wood ashes and hot fat some of the soapworts stayed on in flower gardens.

One of these came to America and is a common garden inhabitant, which sometimes strays away to become a roadside weed, usually under the name of Bouncing Bet. This is the American form of the English name Bouncing Betsy. And if you are curious as to how *that* name became attached to this plant, you will have to refer to a dictionary of 17th- and 18th-century English slang, or go down into the back coves of the southern Appalachians where it still is used. If you lack opportunity to do either, then just remember that this plant was long associated

with household laundering, and then imagine the rear view of a buxom and billowy laundry maid as she vigorously scrubbed her clothes.

As civilization developed, scratch crops gave way to systematic cultivation: agricultural tools were invented; new field methods and garden procedures were developed; and efficient crops displaced the poorer-yielding ones.

Along with his developing civilization man's esthetic sense also was awakening, so that ultimately, instead of being entirely utilitarian, many plants with showy flowers were cultivated solely for their beauty. From such evidences as we have, this beauty appreciation seems to be scarcely more than 10,000 years old.

The Wanderings of Plants

It is sometimes extremely difficult to determine just where a plant is really native.

Hollyhocks often seed themselves along embankments, finally appearing to be native. The blackberry-lily has become a denizen of fence rows in places (page 45). Yet both, Chinese in origin, have escaped from gardens.

High in the South American Andes in Ecuador I once came to a moist place where I found the African calla, the southern European iris, and the northern European pansy, all three growing in profusion and apparently perfectly at home with the native plants. Fifty yards away were some stones giving evidence that a house of the early Spanish era once was there.

From these evidences we may deduce that the owner had brought with him the plants which were growing in his garden in Spain. But the jungle had again taken over, leaving behind these three evidences of man's migrations and of his love of familiar flowers.

The East Indian lotus has always been a problem, for it is a double-threat migrant (page 41). Man has long used its tuberous rootstocks and seed for food—and the seeds are easily transported and viable for a very long time. Also, the beauty of the flowers is such that it early became attached to religious ceremonies.

Thus, botanists have made contact with it apparently growing naturally in such distantly separated areas as Egypt, China, and northern Australia. The evidence, however, points to an origin in southeastern Asia. The story of its wanderings is the story of the early migrations of peoples from southeastern Asia down through the islands of the East Indies, of the contacts between the southeastern Asiatics with the Chinese peoples, and of their contacts

and commerce with the early peoples of India and ultimately with Egypt.

Further examples are the Cherokee rose and the peach. When André Michaux came to America hunting for new plants for European gardens (he was the first to bring the Catawba rhododendron and the flame azalea into cultivation), he found in what is now the region of our southeastern States a beautiful wild rose growing abundantly. Later it was called the Cherokee rose. It has been adopted as the State flower of Georgia. To our surprise, however, the Cherokee rose has since been shown to be a native of China.

Apparently the Cherokee rose originally was taken overland from China to Persia, there to be picked up by the Arab Moslems and carried along with them when they planted their gardens in Spain. The Spaniards later brought it to the gardens of their settlements in Florida, from whence it escaped to become perhaps the most common and most celebrated "wild" rose in parts of the South.

Similarly, when William Penn was negotiating with the Indians for "Penn's Woods," he found the savages cultivating the peach in their gardens. The peach is not a native American; it is a native of China and first came to North America by the same route as did the Cherokee rose. Being a food plant, it was artificially spread on this continent with greater rapidity. The peaches which certain of our Southwestern Indians raise were introduced by Padre Junipero Serra's co-workers into the Californian missions from the trees grown in Mexican gardens, but also introduced there by the Spaniards.

Early Centers of Ornamental Gardening

"And the Lord God planted a garden eastward in Eden . . . and . . . took the man, and put him into the garden . . . to dress it and to keep it."

As an old man sitting in the tents of his people in the land of Canaan, Abraham must have recounted the scenes of his youth in the neighborhood of Ur of the Chaldees. These stories became part of the lore of his descendants. Thus when the later Hebraic scribe set down the early history of his people, he had Adam placed in a *planted* garden full of all manner of animals.

Regardless of the other implications of the story, as described, the Garden of Eden was typical of the artificially planted, royal game preserves (called gardens) already present in the valley of the Euphrates at the time of Abraham's youth.

We know all too little of the early peoples who lived in the valleys of the Tigris and



W. H. Camp

With Botanical Specimens, the Author's Party Returns from Explorations in Mexico

The search for new ornamental flowers has been going on for thousands of years. Here an expedition is returning from Zempoaltepec to Oaxaca, its pack animals laden with living plants and seed of possible new garden species. Dr. Camp, a plant explorer on the staff of the New York Botanical Garden, has traveled widely, searching for ornamental and economic materials, especially for relatives of the rhododendron and blueberries.

Euphrates.* Yet the Sumerians and Akkadians certainly must have had gardens. There were peoples such as the Elamites, whose principal city was Susa, destined under the later Persians to become a famous horticultural center and the source of many of our garden decoratives (for example, *Crocus susianus* and *Iris susiana*). It was in Susa (called Shushan in the first chapter of the Book of Esther) that King Ahasuerus held a garden party that lasted 180 days.

One Assyrian king, Sennacherib, left us writings telling at great length of his gardens—of plants they contained which were more fruitful than in their native homes, of the many places he had sent expeditions to get the plants, and of his extensive irrigation systems, and of the many garden pools he built.

His grandson Assurbanipal, who reigned in the seventh century B. C., left us a fine set of carvings on the walls of the north palace at Kuyunjik which tell us much about the Assyrian garden of his day.

In the history of gardening, the reign of Assurbanipal is important, for it was he who pushed the Assyrian Empire into Egypt. Thus, for the first time the peoples of the

regions of the Tigris and Euphrates came into close contact with the Egyptians and the Egyptian garden (page 8).

Prior to this, the gardens of the region had been planted in an informal, more or less haphazard manner. The Egyptian garden was planted in a geometric pattern. And thus the formal type of planting came to this old Mesopotamian garden center.

Because of an increasing aridity in the region, irrigation was becoming more and more necessary. This brought a system of hillside, terrace farming. When incorporated into ornamental and pleasure gardening, it was called the "hanging garden."

In reality, these hanging gardens were series of terraces, their outer edges supported by pillars. Sometimes the pillars were of brick, and hollow so that they might be filled with earth and thus accommodate the roots of large trees.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "New Light on Ancient Ur," by M. E. L. Mallowan, January, 1906; "Archeology, the Mirror of the Ages," by C. Leonard Woolley, August, 1928; "Cradle of Civilization," by James Baikie, February, 1916; and "Pushing Back History's Horizon," by Albert T. Clay, February, 1916.

Occasionally these hanging gardens were wide-based towers. One of these seems to have been built by Nebuchadnezzar the Great for his little bride, homesick for the green hills of her native Media. Husbands still can feel some kinship with old Neb when the little woman pointedly remarks that it is about time to get out into the garden and do the spring spading.

The Greek historians Strabo and Diodorus saw one of these hanging gardens before it crumbled. They tell us that it was about 1,500 feet long on one side, that it was set back in ascending tiers of terraces, and that because of the plants it held it looked like a green mountain. The topmost terrace, on which was situated the principal garden, was supported by a hollow arch 150 feet high.

Beginnings of the Persian Garden

In 539 B. C. the Chaldean Empire collapsed under the attack of Cyrus, the Persian. The Persians already had garden traditions, but, now in full power, they began a new cycle of intensive garden development.

The idea of the formal garden with the plants in rows and an equal spacing between plants had been brought into Mesopotamia in the time of Assurbanipal. Under the Persians this developed into a real system, especially with the advent of increasing numbers of purely ornamental plants and flowers. With the Persians, horticulture was considered a royal occupation, and special classes of instruction in the art were conducted by and for the nobility. Cyrus is reputed to have boasted of designing his own palace gardens and even of setting out many of the plants himself.

When, in 330 B. C., Alexander the Great looked on the dead body of the last of these Persian monarchs, the Persian garden had developed into a thing of remarkable beauty.

The Greeks did not destroy the gardens which they found, as some other conquerors have done.* Instead, they cherished them and encouraged their cultivation. Marveling at their beauty and magnificence, the Greeks "discovered" the Persian gardens and brought back to Europe some of the plants they contained. However, it was the Romans, somewhat later, who really did the job (page 26).

So far we have merely mentioned Egypt, noting that the formal type of garden came into Mesopotamia from there during the seventh century B. C. Let us roll back the centuries again and see what was happening in Egypt.†

When the doors of recorded history begin to swing open along the Nile, the art of gardening already had developed to a re-

markable degree. Fortunately, these early Egyptians left us a series of carvings and paintings depicting not only the general plan of their gardens but also many of the plants they contained.

From such garden pictures we may readily note that not all the plants they grew were native in the immediate region. Therefore, we must conclude that already many of them had been introduced. To help us in this, we also have carvings showing vessels with their decks crowded with trees and other plants being brought to Egypt.

One of these is the record of a notable plant-hunting expedition which was organized and sent out by Queen Hatshepsut to the "Land of Punt" (page 12).

The love of ornamental plants and flowers finally became so marked in Egypt that Rameses the Great is said to have boasted that he had furnished at least 19,000,000 ceremonial bouquets to the temples.

Other items which we take for granted in our everyday lives can be traced back to this Egyptian love of garden plants and flowers. At some time in their past the Egyptians had begun decorating their temples with sprays of leaves and flowers. Later the supporting columns often were decorated with carved flowers, the water-lily a favorite, with the palm leaf, papyrus, and others also used.

The papyrus design, for example, was made to simulate a bundle of the reedy stems capped by the spreading tops. When stylized and worked in stone, this became a fluted column. The Greeks may have picked up this architectural item from the Egyptians. At least it survives to this day in the fluted columns of many of our public buildings.

Origin of Flowered Wallpaper

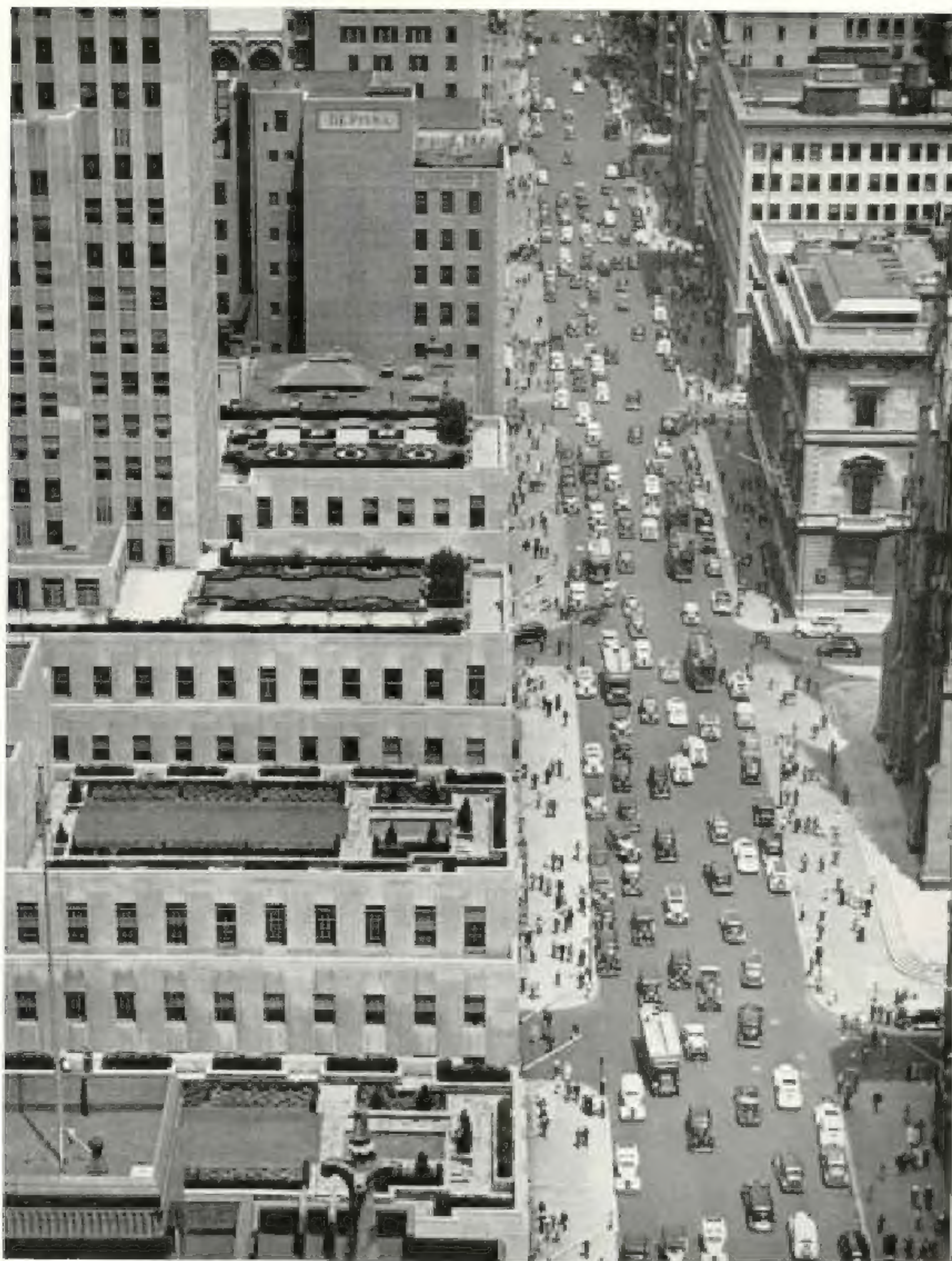
Another thing which the Egyptians started was the painting of their walls and floors with garden scenes. The custom of painting garden scenes on the inner walls of houses was taken over by the Romans after they made cultural contact with the Egyptians.

Excellent examples of such Roman garden scenes are to be found in the excavations at Pompeii. We got the idea from the Romans, and it still survives in our modern figured wallpaper.

Early Persian travelers apparently also saw this Egyptian custom of floor and wall

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Greece—the Birthplace of Science and Free Speech," by Richard Stillwell, and "Greek Ways," by Edith Hamilton, March, 1944.

† See "Daily Life in Ancient Egypt," by William C. Hayes, NATIONAL GEOGRAPHIC MAGAZINE, October, 1941.



Newspictures

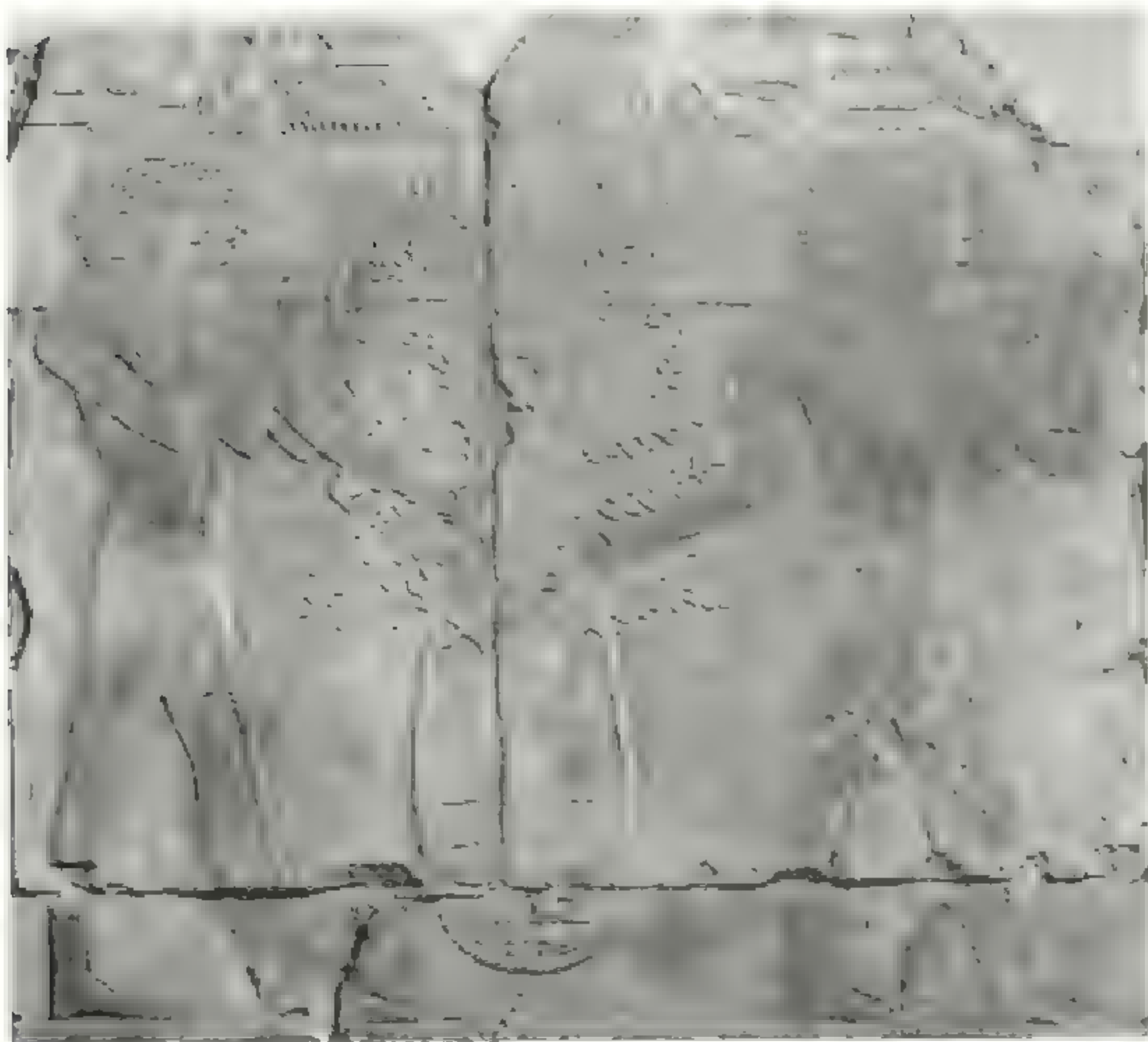
New York Has Its Hanging Gardens Like Nebuchadnezzar's Ancient Capital

Atop the buildings on the Fifth Avenue front of Rockefeller Center these four, with lawns, trees, shrubs, and flowers, commemorate the work of David Hosack, who, on this same site in 1801, laid out the first botanical garden in New York City (page 17). The roof was first covered with a special waterproof material, over which a thick layer of soil was added. Here spindly-stalked species, which break over easily in strong winds, are not too successful.



Prunella Nuttallii with Rhododendron is the Spectacular Blush of Great Smoky Mountains National Park

Prunella Nuttallii is a small, shrubby plant with white flowers. It is often found in the same areas as Rhododendron, and the two plants often bloom together, creating a beautiful display of color. The Great Smoky Mountains National Park is a beautiful area with many different types of plants and animals. It is a great place to go for a hike or to see some of the most beautiful scenery in the United States.



Explorers Brought Plants to Queen Hatshepsut's Garden 3442 Years Ago

This painted cast now in the Metropolitan Museum of Art shows live from incense (*Boswellia*) trees, roots packed in baskets or cloth, being carried to the Egyptian ruler's ship as I had believed to be a land on the Somali coast (p. 51). The voyage took place in 1480 B.C. These roots are reproductions from the so-called "Plant Colonade" of Hatshepsut's temple at Thebes, Egypt, carved about 1480 B.C.

painting and copied it. But with the chilly Persian winters blinding cold walls and clammy tile floors, they had their own garden scenes woven into warm rugs to be used both as hangings and as floor coverings.

Since many of the basic elements of rug design go back to the Persians, it therefore is logical that Persian rug makers often trace their lineage back to the pattern of their floors and walls which the Persians had made so as to bring their gardens indoors (page 36).

Eden Comes to Manhattan

Some time ago I stepped inside a Fifth Avenue flower shop to examine a display of miniature gardens in glass bowls. I was curious only to see the kinds of plants they

contained. When the salesgirl asked if I wished to purchase one, I astonished her by replying that I really didn't think I wanted to invest in a Garden of Eden.

About the time that Hammurabi was founding the first Babylonian Empire, a group of peoples, migrating eastward from what is now Persia, entered India and conquered it. This was more than a thousand years before Assyria came into contact with the Persians. In formalized Egyptian gardens (p. 26, 27, 28) consequently, these early emigrants took along with them the original style of informal, park-like planted garden, often with its animals.

Those who have visited India recently will have noted that the Indian garden at present is rather formal. Under later conquerors who overran the region from the seventh to the

thirteenth centuries at our own era, the Persian garden for the second time was brought to India, this time with its straight rows and formalized planting.

Much earlier, some time between 600 and 400 B. C., Siddhartha Gautama, founder of Buddhism, was born in what now is an overgrown jungle region on the borders of Nepal. After his revelation under the ba-tree (botanically a species of fig called *Ficus religiosa*, commonly planted along streets and in gardens in warm regions), Gautama went to Benares. There he and his first converts built shelters for themselves in the "deer park," a garden in the style of the old game preserve,

Garden of Buddha

From the first, the teachings of Gautama had been carried on in the quiet of a naturalistic garden, and from this arose the tradition among his followers that their most effective work would be accomplished in the same environment. Therefore the missionaries took with them not only the teachings of Buddhism but the tradition of the informal garden as well.

By the latter part of the third century B. C., Buddhist missionaries were pushing across the passes into central Asia and ultimately into China. In China the Buddhist garden underwent a great development through the centuries. When Marco Polo visited China (between A. D. 1272 and 1295)* and saw such royal gardens as those of Kublai Khan at Samarkand and at Cambaluc he was astonished at their magnificence.

Later on, the lesser folk of China copied the royal gardens but reduced them in size, employing artificially dwarfed trees to keep the overall landscape in scale. And if one had no plot of ground, then one bought a dish and in it planted an even smaller model which could be grown in a sunny window.

When the Chinese garden was introduced into Japan by later Buddhist missionaries, the miniature garden went along, there to be even more rigidly and statically arranged.

If you happen to own one of these overcrowded and usually poorly arranged imitation Chinese dish gardens, at least you will have the satisfaction of knowing that your little garden-in-a-dishbowl is a direct lineal descendant—by way of the Chinese gardens which Marco Polo saw and of the Indian garden in

which Gautama preached—of the royal game preserve and hunting park which already was common in Mesopotamia when Abraham left Ur of the Chaldees to go over into the land of Canaan. It is, therefore, a miniature of the Garden of Eden.

The History of Two Gardens

Two acquaintances of mine, who also are neighbors, are fast friends. They agree on almost everything except their gardens.

One has a garden with a central stretch of lawn, at the end of which is a pool shaded by a graceful birch tree. At the border of the lawn is a mixture of flowering shrubs and herbaceous perennials, with here and there sprightly touches from such groups of annuals. It is a completely informal affair, yet there is not a clump between April and October that one cannot find some floral surprise peeping out from an odd corner.

On the other side of the dividing line one finds in the other friend's garden closely clipped hedges and planted beds in geometric form. The beds contain flowers, but only those sorts which will not interfere with the neatness of the design. Near the corners stand flat yews, so carefully trimmed and trained that they scarcely are recognizable as such until closely examined. At the center of this formal garden a birdbath stands on a pedestal.

Each of my friends has followed an ancient custom in garden making.

From carvings it seems that the Egyptians sometimes clipped and trained their shrubs and trees. Apparently the Romans picked up this idea from the Egyptians (certainly it was not from the Persians) and carried it to great lengths†. In its ultimate form, this topiary work in the Roman garden was such that clumps of trees and shrubs were trimmed to resemble such things as ships in full sail, or hunting scenes, complete with the stag and hounds in full flight.

Then, for about a thousand years, Europe was wrapped in the Dark Ages.

Six years after the printing presses were set up in Italy, or in 1471, a manuscript written a century earlier by Piero Crescenzi of Bologna was published. This *Opus Ruralium Commodarum* had been compiled from the old works of such Roman horticultural writers as Varro, Columella, and Cato, but Crescenzi added his own ideas about garden matters.

Soon translated into Italian, French, and German popular editions, Crescenzi's book opened up a whole new vista of gardening. It was so influential that its publication can be said to mark the beginning of the Renais-

* See "World's Greatest Overland Explorer," by J. R. Hulcebrand, *National Geographic Magazine*, November, 1924.

† See in the *National Geographic Magazine*, "Ancient Rome Brought to Life," by Rhys Carpenter and "The Roman Way," by Edith Hamilton, November, 1916.

source, so far as gardens are concerned. While in it the humble and needle-class folk were encouraged to have gardens if at all possible, it was the upper class and nobility who were enjoined to sponsor the building of gardens—and on a magnificent scale.

The culmination of the development of the formal gardens of the Renaissance—a form which was based on the Roman garden—was reached in the gardens at Versailles developed by André Le Nôtre for Louis XIV.*

The Dutch garden, although unlike the French garden with its great vistas, was also formal, being cut up into small flower beds. These types both went to England and there the two styles were mingled. The English formal garden also usually exhibited considerable "hush hatching," or tofary work and clipped hedges. This type came to colonial American gardens.

Thus we trace the geographical wanderings of the formal garden from Egypt to some of our own back yards.

Odyssey of the Informal Garden

Following the odyssey of the informal ornamental garden will take us further. As we already have noted, it began in Mesopotamia. From there it went to India and on to China.

Between the years 1735 and 1772 a series of books on Chinese and other Oriental gardens, written by keen observers who had been there and seen them, appeared in England. While some who tried to imitate and follow these descriptions got no further than sticking mock pagodas into their gardens, others caught the spirit of the studied informality of the Chinese garden and put it to excellent use.

Coupled with greensward, this Anglo-Chinese garden became what we now call the typical English garden—a lawn surrounded by a mixed border of ornamental plants in an informal but pleasing array. More recently, this type of garden has become increasingly popular in America.

Different as are these two garden types, they still have one thing in common—the ancient water supply.

When gardening first began, it was noted that there were occasional periods when the plants needed water. For convenience the gardens were located near a spring or pool.

In spite of our hoses and automatic sprinkler systems, we still almost always manage to slip the time-honored water supply into our gardens in some form. The pool will still be there, or a combination fountain and pool. In

this instance the fountain represents the original bubbling spring.

There is a pool in the garden of my one friend. My other friend stoutly denies that he has a pool. But it is there just the same. All he has done is to raise it into the air, put a pedestal under it, and call it a birdbath.

Californians have every reason to be proud of their patio gardens. Imitations have been attempted in the North, but they come short of expectation because the plants characterizing them usually will not stand cold.

But this interesting garden type is not Californian. And, for that matter, it is not Mexican. It goes back much further.

The Persian garden was carried on the crest of the wave of Moslem conquest across North Africa and ultimately into Spain, where the Moors built great gardens. The first Spanish Emir, Abdur-Rahman, chose Cordova as his capital in 755. There he fashioned a garden such as he had known in his youth in Damascus.

It is said that he sent agents and plant explorers from Spain as far east as Syria, to the borders of China in Turkestan, and even into India, to collect plants for this garden. It was not until 1492 that the last of the Moslem strongholds in Spain surrendered to Ferdinand and Isabella.

A fertility and blessing-of-the-crops rite was celebrated among the ancient Babylonians and Assyrians. This spread to an offshoot of this culture, to the Phoenicians. It was taken to Cyprus, an old Phoenician colony, and later to Greece where, about the seventh century B. C., we find it celebrated as the Adonis festival.

How Potted House Plants Began

At first in this festival, quick growing plants such as lettuce were put in pots. Later more permanent and decorative plants were used. And so began the custom of raising plants in pots around the house. This custom was picked up by the Romans and taken to Spain. There it was wedded into the Mohammedan garden and became the Spanish type.

When Cortes conquered Mexico, he found excellent gardens, much better, in fact, than anything at that time in Europe. But these Aztec gardens were destroyed by the Conquistadores, so that today only slight vestiges of them remain.

Consequently, when the Spanish settlers and clergy began to flock to Mexico, they had to start their gardens all over again. Naturally they used the type with which they were most familiar—the garden they had left behind in Spain.

* See "Palace of Versailles—Its Park and the Fountains," by Franklin L. Fisher, *National Geographic Magazine*, January, 1908.



Human "Bees" Perform a Delicate Task

Only the Spanish Pottery Farms could produce the Land rye & have the giant pettingas so that seed could be sown. This carefully cultivated hand-picked material is the only way that the rye can be sown in the garden. This is the only way that the rye can be sown in the garden.

Thus the garden of the Mexican style, which fitted into the Mexican style of architecture also brought to this hemisphere came to Mexico. Its features were a well—the old water supply canal—with small flower beds and a few trees, and almost always some potted plants.

Rock Gardens Get Under Way

This characteristic but simple type of garden was taken from Mexico into California by Padre Serra when he established his system of missions. And that is how the Persian garden, plus a fertility rite represented by the potted plants, came to California.

There are some who see a beginning of the rock garden in the gardens of the old and old Roman gardens. There may be a touch of it in them, but the modern rock garden can be given an exact starting date.

Thus the old Dutch herbalist, however, in the Alpine plants while in Amsterdam we shall meet him later uttering about his tulips; page 281. Others tried to raise this specialized type of plant, but also without any great success. We now know that these Alpine plants require special types of drainage and soil conditions.

Apparently the first person to have any real success with these plants was the English botanist and plant explorer, Sir Joseph Banks. He had some of the Liza rock which he had brought back from Iceland on one of his expeditions. These, together with some old ones dumped out from repairs then being made on the Tower of London, and some bones of old bricks and chalk rock, as well as a quantity of broken brick, constituted the basis of the "rockery" which he constructed in the old Chelsea Physic Garden in 1762.

Plant Explorers and Hybridists

With the opening of the 18th century the intellectual ferment of the Renaissance revived the ancient passion of plant collecting.

From China, Japan, Ceylon, India, Australia, Africa, the Near East, from the West Indies, North America and South America.

From the whole world—plants began to come in. The botanical centers of Europe were stirred, and gardeners were in constant contact over the succession of growing new ones. It was the Golden Age of the plant explorer, for it was a period when the world was being explored, and the new plants were being discovered. The world was a new place.



In a New York Studio Mrs. Elsie Hostelmann "Grew" THE GERMANY'S 24-page Flower Garden

The plates, drawn by me from the life, Dr. W. H. Dallard & I, New York, obtained from the artist, are now deposited in the Academy of Natural Sciences, Philadelphia. We have made the plates appear in the November number of the *Annals of the Entomological Society of America*, Vol. 1, pages 101 and 102. The plates are printed from the original drawings by the Smithsonian Institution, Washington, D. C., and are of the highest quality.

degraded portions of the wood components and
for the general use.

in the middle of March for a long time but not as long as the soldiers say. The soldiers who were soldiers and were in the middle of the war and the soldiers who were in the middle of the war and the soldiers who were in the middle of the war.

[illegible]

This note is a follow-up to the author's previous paper on the topic of the same name, published in the *Journal of the American Statistical Association*, 1998, 93(443), 1081-1090. The author is grateful to the editor of the *Journal of the American Statistical Association* for the opportunity to publish this note.

[illegible]

Latino had a more complicated relationship with the United Nations and had a more complicated history. Since a lot of Latin American countries had come to the United Nations in the 1960s, and by the 1970s, probably had more votes in the United Nations than the rest of the world. A considerable portion of the population was growing fast. American people, however, were not very friendly to the United Nations, and the United States was not very friendly to the United Nations.

$$\begin{aligned} & \mathcal{N} = \{ \alpha \in \mathbb{H} : S_{\alpha, \alpha} \in \mathcal{C} \} \quad \text{with } \mathcal{C} = \{ C \in \mathbb{H}^n : \\ & \text{Hess } f|_{\mathbb{H}^n} (C) = 0, \text{ and } \text{rank}(C) \leq n - \dim \mathcal{N} \} \end{aligned}$$

plants fitted for that climate.* At Charleston, Alexander Garden, physician and planter, was carrying on a correspondence with Linnaeus, the great Swedish Botanist. The *Gardenia* was named for him. And it was at Charleston that André Michaux, that peer of early American plant explorers (page 6), had one of his nurseries and collecting stations.

Another Charlestonian—but of a somewhat later period—is especially remembered during our winter holiday season, for the Poinsettia was introduced by and named in honor of Joel R. Poinsett.

The Virginians were not behind their neighbors. Those who visit Mount Vernon can easily see in the restored garden, laid out according to the diary and notes kept by George Washington, that he was a lover of plants and a grower of no mean ability. With a scientific turn of mind, Thomas Jefferson—who wrote on matters of natural history as well as on government, had, like Bartram, a wide correspondence and introduced many new plants and garden methods.†

Other gardens were springing up. In 1801 Dr. David Hosack acquired a plot of 20 acres from the City of New York and laid out a botanical garden. The Elgin Gardens, as he called the plot, lay on what now is 5th Avenue between 50th and 51st Streets, where Rockefeller Center stands. The roof and terrace gardens now atop this modern structure, commemorating Dr. Hosack's efforts, are reminiscent of the 'hanging gardens' which Nebuchadnezzar built in Babylon (page 91).

Since the days of the early Dutch, French, and English colonists, botanical gardens have been active in the discovery and development of new garden materials in all parts of the world.

Large and famous private nurseries had been springing up because of the increased interest in gardens. And many of them had their own botanical explorers who brought together stocks of additional garden material. Furthermore, especially in Europe, these nurseries became the centers of hybridization and selection of new forms of ornament.

This activity eventually came to this side of the Atlantic; and American nurserymen, with the newer techniques supplied by recent

advances in the knowledge of the breeding of plants, are now taking the lead in this necessary and basic phase of floriculture.

Today one cannot walk into a garden without seeing on every side the results of the work of the plant breeder. It is the job of the plant explorer to bring the material out of the world's far places. The hybridist and selector then work over it, sometimes for years, finally to pass it on to us in the form of choice garden flowers, often quite different from what they originally were in the wild.

Selection of Plants for This Series

Some time ago Mrs. Bostelmann, already well known to me through her paintings, came into my office and asked if I would give her a list of about a hundred kinds of flowering plants commonly grown in American ornamental gardens, together with the countries where they originally were native. I seemed like a simple affair; that is, until I really got into the job.

Today man cultivates about 25,000 species of plants. Of these about 10,000 are chosen for the ornamental value of their flowers. Of this latter number, several thousand might be classed as being fairly "common" in America.

In making up this list, we selected a representative number. The name and country of origin of each was put on a card, and cards were sorted by the geographic regions of origin so as to give some idea of the proper use of the paintings to be devoted to each region.

Then by a process of further selection the list was reduced to only two hundred species—still twice too large. Discarding that last hundred seemed almost like turning one's back on one's best friends.

As a last resort, in certain instances the cards were turned face downward, shuffled, and the number which Mrs. Bostelmann needed to complete a plate selected at random.

If your favorite garden flower happens to have been omitted, it very likely was among those which were not pulled out of the pile.

This also will explain to gardeners why species with greatly dissimilar climatic and soil requirements, or of different blooming periods, sometimes appear in the same picture.

For perhaps six months a most miraculous thing happened. All I did was to lay out the plot. The artist planted the garden and tended it, and there on her easel these plants bloomed.

The following series of paintings—"Mrs. Bostelmann's garden," as her friends called it—is certain evidence of the marvelous climate and growing conditions which can be found in an artist's studio in Manhattan.

* See in the NATIONAL GEOGRAPHIC MAGAZINE, "Ashley River and Its Gardens," by E. T. H. Shaffer, May, 1926, and "Charleston, Where Melrose Park and Present Meet," by DeRose Herward, March, 1929.

† See in the NATIONAL GEOGRAPHIC MAGAZINE, "Home of the First Farmer in America (Mount Vernon)," by Worth F. Shultz, NATIONAL GEOGRAPHIC MAGAZINE, May, 1926, and "Jefferson's Little Mountain," by Paul Witherby, April, 1929.



Common Weeds Become Ornamentals in Medieval Courtyards. Turf Sent Abots the Wall
 and M... .. Bellflowers
 Modern and a few Pansies occupy the

From Medieval European Gardens

THE far-flung empire of the Caesars had at last crumbled and the *pan Romana* was a thing of the past. Political and economic chaos reigned in much of the then civilized world. Brigandage was rife. The common folk deserted their farms and crowded their cottages beneath the overhanging battlements of the great fortified castles to be near protection in case of raids.

The Dark Ages descended upon Europe. During the constant turmoils and alarms many of the vegetables and flowers previously introduced by the Romans were lost and, having no access to the gardens of the outside world, the people of medieval Europe turned to the plants of their own woods and pastures as a source of garden materials.

The first of these "garden introductions," such as the daisy, primrose, pansy, and bellflower, were purely accidental, probably having come in as weeds or been brought in with the turf used to construct rude seats beside the castle walls. One of these turf seats is shown in the accompanying picture.

Sometimes the roots of a cherished fruit tree or flowering shrub were protected from the trampling hoofs of the horses by wickerwork. And the nose-me-odors and insubstantial surroundings of a medieval castle courtyard these flowers cast a welcome fragrance and brought a note of gaiety and freshness to an otherwise drab scene.

Although they had not heard of nutritional deficiencies, these people early learned the value of green material in the diet. Many of the wild herbs, as the pot marigold, also had colorful flowers and found their way into the early castle gardens where for a long time they did double duty, furnishing both beauty and vitamins. A bunch of verbena seasoned with marigold and mint, together with a stew of roses and primroses and garnished with a chopped salad of wild onions and violets, graced the board at many a knightly feast.

The castle on the far hill in the accompanying plate is not entirely imaginary. It is taken from an actual castle, built in the 9th century, but now in ruins. It is the ancestral home of the artist who has given us this series of garden flowers.

POT MARIGOLD (*Calendula officinalis*): Grown originally as a pot herb as well as for its supposed medicinal properties and religious connotations (whence the name Mary's Gold), the flowering heads still are occasionally used as a savory. Selected garden forms with large "double-flowered" yellow or orange heads are now mostly cultivated.

BELLFLOWER (*Campanula*, various species): The Bluebell (*C. rotundifolia*) is still common in turf and must have been introduced early. The Chimney Bellflower (*C. pyramidalis*) also came into gardens by this same route. Another member of this large genus of nearly 250 species which must first have been accidentally introduced is the Canterbury Bells (*C. Medium*). Today its wild form is rarely seen in cultivation; the common garden form is being the hose-in-hose, wherein the calyx is most fast and colored and encloses the corolla, and the popular cape-and-sauver form, in which the much-enlarged and colored calyx is widely flared.

DAISY (*Bellis perennis*): This charming little plant, the True or English Daisy, was and still is a weed in European fields and meadows; many excellent garden selections are now in cultivation. Chaucer referred to this plant as the "ee of the daie," and by Ben Jonson's time it was called "Day's Eye."

PANSY or **HEARTSEASE** (*Viola tricolor*): Our garden pansy has been derived from the weedy "three-colored violet" of Europe; hence the scientific name, *Viola tricolor*. It seems likely that several other species, through hybridization, have contributed to the modern forms of this plant. The English words "pansy" and "pensive" come from the French word *pensée*.

PRIMROSE (*Primula*, various species): Such species as the Field Primrose (*P. vulgaris*), the Ox-lip (*P. elatior*), and the Cow-slip (*P. veris*) are common in European pastures and also must have been brought in with the sods from which the turf seats were made. A plant of the wild, yellowish-flowered Cow-slip (not "Cow-slip" as most of us pronounce it) is shown opposite. With it is part of a truss of flowers of a plant now more often grown, the garden "Lilyanthes," a colorful group derived by selection from among the many hybrid combinations between the Field Primrose, the Cow-slip, and the Ox-Lip.

ROSE (*Rosa*, various species): At least three wild species were available to the people of medieval Europe, the French rose (*R. gallica*), the Dog rose (*R. canina*), and the Eglantine or Sweetbrier (*R. Eglanteria*). The last of these was enshrined in song and story. It may be a surprise, but the Rose was valued for food before its beauty was appreciated. The fruits, especially, were eaten; we now know that they are very rich in vitamins.



The Discovery of the garden was complete with the garden and garden
 The garden was complete with the garden and garden
 The garden was complete with the garden and garden

Europe Contributed Flowers and Words

EUROPEAN languages changed and developed as ideas and vocabularies enlarged through the broader contacts with other peoples. Yet, although often greatly modified, the names for familiar objects still contained words derived from their former association with folklore and ancient uses, as well as modifications of the early sources of the names themselves. These still are reflected in the modern names of many of our common garden plants.

FOXGLOVE (*Digitalis purpurea*): So popular is this decorative garden plant with its dramatic spikes of flowers in varied colors that we sometimes forget that it also is the source of the ancient and still much used medicine, digitalis. In the Old English folklore this plant was called *Foxes gloht*, a portmanteau and fanciful term which means the same as the modern name.

STOCK or GILLIFLOWER (*Matthiola incana*): In its wild form this species is a coarse shrubby perennial with single reddish or dull purplish flowers. A sprig of the original reddish wild type is shown in the lower central part of the opposite plate. Through the years another form of this plant has been selected and now is the one usually grown. This is the variety *annua*, or Ten week-stock, which comes in various colors and degrees of doubling, several of which are shown in the central part of the plate.

The name Stock—which seems to be only a few centuries old—probably was derived from the fancied resemblance of the stiffly flared petals to the distinctive collars, called "stocks" which men used to wear. The name Gilliflower, also often applied to this plant, has had a much longer history. We first pick it up in the Greek as *karophyllon* or "carnatie-leaf," a name applied to some plant (possibly the progenitor of our modern Carnations) whose leaves were shaped like the keel of a boat.

The Romans conquered the Greeks and absorbed many of their words. This one was among those taken and, with their own linguistic modifications applied to plants with similar leaves. The Roman legionaries marched into Gaul and carried the equivalent Latin word with them, where it was taken up by the native peoples, further modified, and applied to various plants, among them being what we now call the Clove Pink or Carnation, Wallflower, Stock, and do-a-dress-others.

By that time the original Greek name had been so changed and mutilated by its passage through classical Latin into the every day Latin

of the common people, and from thence into the early French language that it had become "Gilloflée."

With a curious transposition of the "f" and "l," the word got into England, where it seems first to have appeared as "Gillofre."

By later modification this became "Gillifer." As the language developed, "Gillifer" gradually changed, probably into "Gibbler," then "Gilliflowr," and finally "Gillflower," which, in its modern English compound form, means nothing at all. However, it stands as a constant reminder of the devious routes and curious changes through which so many of our English words have come to us.

WALLFLOWER (*Cheiranthus Cheiri*): Originally a native of southern Europe where the climate is seasonally warm and dry, this little plant did not favor the cooler and moister soils of the more northern regions. However, as man began to build houses, castles, and earthworks in central and northern Europe, their walls afforded sunny nooks with warm and dry niches where this little weed could flourish, and so it migrated northward. The origin of the common name, therefore, is obvious. A single tuft of the wild form of the Wallflower is shown toward the right margin of the plate. It now is cultivated in various colors; double-flowered forms also are known.

Both the Stock and Wallflower are members of the Mustard, or Crucifer Family. The word "crucifer" refers to the cross-like appearance of the four petals of the usual wild type of flower. The word "mustard" traces back to a time when this ancient continent, derived from yet another member of this large family of plants, was prepared by mixing it with "must," or new, unfermented wine.

SWEET SCABIOUS (*Scabiosa atropurpurea*): Of the many colors in which this species is now grown, only three are shown here, the blue, deep red, and pink. The deep purple (almost black) forms are often called Mourning Brides. The plant also is sometimes called Pincushion-flower, but the old name Scabious still seems to be preferred, a linguistic legacy of that lusty period in our history when bathing was both a luxury and a social affectation. In those days an old European garden was not complete without its plot of Scabious; the flowers may have been pretty, but the plant was more valued as a cure for the "scabious," or itch.

Here in this charming modern garden plant we have a reminder of a rather earthy and unwashed period in our ancestral history, as well as a link with the language of the past.



Spring's Magic Touch on Winter's Dormant Flowers Colours an Alpine Meadow

The first part of the paper is devoted to the study of the asymptotic behavior of the solutions of the system (1.1) as $\epsilon \rightarrow 0$. In the second part, we study the asymptotic behavior of the solutions of the system (1.1) as $\epsilon \rightarrow 0$. In the third part, we study the asymptotic behavior of the solutions of the system (1.1) as $\epsilon \rightarrow 0$.

European Meadows and Our Lawns

WHEN I take a stroll with the camera through those shown on the opposite page back to their ancestral forms, it is found that originally, millions of years ago, they were neither bulbous plants nor spring bloomers. Instead, their ancient progenitors usually were plants of the equable Tropics, which either were overtaken by large-scale climatic changes in their original home or began venturing into areas where climatic conditions were seasonally unfavorable. It is impossible here to trace the story step by step, but eventually various types of storage mechanisms were developed—among them bulbs—which permitted the plants to tide themselves over unfavorable seasons. However, the next period favorable to growth might be too brief to permit the production of a complete set of leaves and flowers and also to bring the fruit and seed to a fully mature condition.

In the untold millions of years during which this natural experimentation on how best to survive and perpetuate their kind under fluctuating seasonal conditions was going on, the problem was attacked in various ways. Plants which had acquired the bulbous habit frequently solved it by telescoping operations and producing the leaves and flowers for the next season at the end of the previous season's growth. All this is accomplished, usually with the new structures nearly complete and packed into a minimum of space within the protective covering of the bulb, before the plant goes into its dormant period.

These preformed parts are easily seen if one cuts carefully down through a large bulb such as that of a tulip or hyacinth. They are so nearly complete that little more is needed than for the storage part of the bulb to pump water into them and blow them up to full size. The way this complicated process is regulated and the feat accomplished is another story. But the foregoing explains why bulbous plants such as those in the opposite picture can come into bloom so early in the spring.

Of the plants shown opposite, the Crocus is perhaps the most easily naturalized in lawns. In this work care should be taken that we do not get the lawnmower out too early. For some weeks after the flowers have passed, the leaves are busy manufacturing the food necessary for the production of the next year's flowers. By then the first mowing will be a little more difficult, but the Crocuses will be better for this delay.

STRING CROCUS (*Crocus vernus*): Of the nearly 75 species of this interesting genus this one is most commonly planted. Being a native

of southern and central Europe and frequently found in profusion in Alpine meadows, it is perhaps more at home in our northern lawns than various of the other species, most of which are native in the Mediterranean region or in western Asia. However, it is not unusual also to see sprinkled across a lawn an infiltration of the yellow tints of the Balkan Crocus (*C. maritimus*—the specific name means "from the land of the Marsians," or Balkans), or the Cloth-of-gold Crocus (*C. aureus*), a native of the Crimea, but introduced into modern culture from the gardens of the ancient city of Susa in Persia.

"Crocus" is the Greek name of the Saffron, another species of this genus. Unlike the plants of this group with which we are most familiar, the Saffron (*Crocus sativus*) blooms in the autumn; it is the source of a substance long used both as a textile dye and as a table condiment in Asia Minor. As a source of saffron, only the small, 3-parted style branches from the center of the flower are gathered. Crocuses belong to the Iris Family.

SNAKES HEAD or CHECKERBELLIED (*Fritularia meleagris*): There are perhaps 70 species of fritillaries scattered around the world in the North Temperate regions, some being native in North America. The European species shown here, possibly because of its long domestication, seems to do as well as any in our gardens and is interesting because of its curiously mottled flowers. The shape of the flower led to the generic name; it was derived from *fritillus*, a dice box. The specific name, *meleagris*, means "speckled like a guinea hen." The fritillaries belong to the Lily Family; we shall encounter another and different species of this genus in our Persian garden (p. 30).

SNOW DROP (*Galanthus nivalis*): This impatient little member of the Amaryllis Family is not to be trusted as a seasonal indicator, for it is likely to push up during any warmish spell after the middle of January, just in time to get itself covered again with snow. The generic name, *Galanthus*, means "milk-flower"; the specific name, *nivalis*, is apt, for it means "snowy." A somewhat similar species, the Snowflake (*Leucojum vernum*), a member of the same plant family, also a native of Europe and often planted in gardens, is sometimes confused with the Snowdrop. In the Snowdrop the flowering stem is solid, and the three inner flower segments are much shorter than the three outer ones, in the Snowflake the flowering stem is hollow, and the six flower segments are essentially alike.



A Mediterranean Garden Reminds the Florist Legends — Dead Civilizations

By the time the sun is high in the sky, the garden is a riot of color. The flowers are in full bloom, and the air is filled with the sweet scent of the blossoms. The garden is a testament to the art of the florist, and it is a reminder of the legends of the dead civilizations.

The Mediterranean Region Has Many "Bulbs"

FROM the abundant evidences of ancient man found there, it would seem that what now is mostly an arid wasteland across much of North Africa was once a well-watered region supporting a large population. Also, geologists tell us that about the same time what is now the basin of the Mediterranean Sea was a broad valley formed by a slow down-buckling of the earth's crust. Long before the dawn of written history—not less than 10,000 years ago, but probably not more than 25,000 years ago—the Atlantic Ocean spilled over into this natural basin and filled it. Thus did the Mediterranean Sea in its present form come into being.

What manner of people inhabited this valley prior to the Great Flood we may never know, but those who lived on the higher ground around its rim left enough clues in the form of rubbishy heaps and cast-off remnants of everyday existence that we can get some insight into their lives.

These early peoples of the Mediterranean basin had domesticated some of the animals they formerly had hunted. Probably the first was the dog, once a hunting companion but later an assistant in herding. Goats and sheep they had as well as cows. They were also tillers of the soil, for they were well acquainted with such things as wheat, barley, millet, and peas. Flax was grown for fiber.

Of their leafy vegetables we know little except by inference. However, one of these, a member of the Mustard Family, has been in cultivation so long that it has given rise to such different-looking things as Kale, Brussels Sprouts, Cabbage, Cauliflower, Broccoli, and Kohlrabi, all of which are no more than garden varieties of a single species, *Brassica oleracea*. This species is still wild in its primitive form on the cliffs along the northern rim of the old valley.

Following the advent of vegetable growing came the cultivation of flowers. When we first pick up the thread at one of the great civilizations which later sprung up around the Mediterranean, that of Egypt, these people already had a highly developed sense of gardening. Funeral wreaths found in the Egyptian tombs indicate that they were growing such flowers as the Lily, Cornflower, Marigold, and Narcissus, and their carvings and paintings show many more.

Other centers of culture arose. There were gardens at Cnossos in Crete and at Tyre, the Greeks and early Carthaginians grew flowers, and the Romans finally took up ornamental gardening. These civilizations have long since perished and their architectural marvels mostly

turned to rubble; yet the flowers sowed and carefully nurtured by these ancient floral tourists lived on, eventually to find their way into our gardens. The modern forms are very different from the early types.

Like all regions which have considerable seasonal fluctuation in available moisture, the Mediterranean and contiguous areas are unusually rich in bulbous plants. Bulbous forms are most common in the Lily and Amaryllis Families. Members of the Amaryllis Family native around the Mediterranean which also might have been included in this series are the Jonquil and Poets Narcissus. The plants on the opposite page belong to the Lily Family.

GRAPE-HYACINTH (*Muscari*, various species): The 40 or more wild species of Grape-Hyacinth are most abundant in the Mediterranean region, ranging eastward into Asia Minor and slightly beyond. One of these, *Muscari botryoides*, a native of the European segment of the Mediterranean basin, has made itself at home in our gardens and frequently escapes into lawns and waste places. The species differ considerably in flower size and density of cluster, and to some extent in color.

STAR-OF-BETHLEHEM (*Ornithogalum*, various species): The *Ornithogalum*s first came into cultivation by way of the vegetable garden, the fleshy bulbs being the part used. It is a large genus, with about 100 species in various parts of the Old World. The true Star-of-Bethlehem, *O. umbellatum*, native around the Mediterranean, is now widespread and often escapes, sometimes becoming a pestiferous weed.

COMMON HYACINTH (*Hyacinthus orientalis*): The 30 or more species of Hyacinth are scattered mainly from the Mediterranean region into tropical and South Africa. It is not clear, when Linnaeus christened our species, whether he thought it was from eastern Asia or from Asia Minor, in those days sometimes called the "Orient." Actually, it seems to be native from Greece eastward along the Mediterranean into Asia. Probably originally purplish, the Common Hyacinth now comes in many colors. The rather sparse-flowered white form also shown is the Roman Hyacinth, botanically known as *Hyacinthus orientalis* variety *albus*, which also may be light blue. This Roman Hyacinth with its striking blooms is especially popular for winter forcing. It is said to be native along the Mediterranean, westward of the basic species, from Italy into southern France.

Other Mediterranean Species

BY THE time of the Emperor Trajan (A. D. 98-117) the Roman Empire had expanded so that it reached from Britain into Africa and eastward to Egypt, the Persian Gulf, and the Caspian Sea. Its commerce went still farther. Tin came from the Cornish mines and other metals from Spain.

Asia was tapped by camel caravan through the Persian gateway. And each year fleets set sail from an Egyptian port on the Red Sea for India and Ceylon. They would return about six months later laden with the wonders of the Orient. Carried overland by camel train to the Nile, thence downriver to Alexandria, these precious cargoes were then transhipped and sent on to Rome.

Before the stirring days of Julius Caesar the Romans had gardens of sorts but they were as nothing compared with those which developed later. After the Roman legionaries had seen the cultivation of strange plants in Egypt, as well as the marvelous floral displays in Asia Minor, their leaders coveted such gardens. But even as late as the time of Pliny the Younger (A. D. c. 62-113), who left us excellent accounts of his several gardens, the strictly ornamental plants were few and almost none of those which are native to the warmer regions.

With the accumulation of wealth, the acquisition of great estates, and the building of public parks, and because of the rapidly expanding commerce of the time, living plants and seed from the faraway places of the world began to flow to Rome. In turn, Roman officials ordered to the distant parts of the Empire took garden materials along with them. In this manner many exotics got to western Europe for the first time.

For three centuries after the time of Pliny horticulture developed and Rome became a city of magnificent gardens; also, as the city became congested, many summer vacation villas were built outside the town or near the sea, where one could sit on the terraces and look out over the blue waters of the Mediterranean. Such seaside villas soon became fashionable throughout the Empire.

However, at the same time, because of faulty understanding of government, the Romans were sowing the seeds of their own destruction. The peoples to the north were becoming unusually restless and, in the year 410, Alaric the Goth marched through Italy and captured Rome. Later the Vandals left Spain, took Carthage, and from that base in A. D. 455, sacked Rome. With that the Dark Ages settled over Europe.

Being abandoned, the great gardens and

villas fell into disrepair, and without the necessary care the great majority of the exotic plants perished. Nor was there any real attempt to rear or clone them for almost another thousand years. Except for a few pockets of culture (the Arabs were developing their own style of gardening which they later introduced into Spain), ornamental gardening around the European edge of the Mediterranean during the Dark Ages was curtailed and almost limited to species, such as the following, which were native there.

OLEANDER (*Nerium Oleander*): This shrub is often grown indoors in the North to be set out in the summer; in the South it is quite hardy. The botanical name combines two very old ones. *Nerium* is the Greek name for the plant; *Oleander* is a Roman folk name and refers to the resemblance of the leaves of this plant to those of the Olive Tree or *Olea*, its name in classical Latin. Our word "oil" stems from the same root-word.

SNAPDRAGON (*Antirrhinum majus*). When the sides of one of these flowers is pressed, the two lips snap open; hence the English common name. The name *Antirrhinum* is derived from the Greek and means "shaped like a nose."

CANDYTUFT (*Iberis*, various species): The 35 or so species of Candytuft are scattered around the Mediterranean region. The dwarfish, annual, white-flowered Rocket Candytuft, *I. amara* (from *amarus*, referring to its bitter flavor), is often grown and may become weedy. The closely related *I. umbellata* (in reference to its flower cluster) is somewhat larger and comes in shades of rose, red, and purplish. Another group of species represented in our picture by *I. sempervirens* is perennial and evergreen ("semper-virens"); other species of this group come in varying colors. *Iberis* is the ancient name for Spain, from whence came several cultivated species. The English common name does not refer to something eaten but is a corruption of Cande (Candia), the ancient name for the island of Crete, where another species is native; hence the "tufted plant from Cande," or "Cande-tuft."

On the terrace are two other Mediterranean plants often grown in warm regions. One is the Italian Stone Pine, *Pinus Pinea*, the source of the commercial European "pine nuts" used as food. The other is the True Aloe, *Aloe Vera*. It has been found recently that the juice from the succulent leaves of this Aloe is helpful in the treatment of X-ray burns.



Various Native Plants Persisted — Seaside Villas Abandoned by the Boerers

On the left, a large, ornate house, and a small boat in the water. The scene is a coastal landscape, likely in South Africa, showing the remnants of a Boer settlement.

Turkey and the Tulips

THE gardeners of Asia Minor long have favored the tulip, for its culture is admirably fitted to their short springs tucked briefly between bleak winters and parched summers. By putting the tulips on a Turkey page there is no intention to imply that the species are all native there, although many are. The fifty or so known wild species are scattered from the Mediterranean region eastward into Asia, and wherever they grow wild they have been brought into cultivation.

However, let it be said to the everlasting credit of the early Turkish gardeners that they brought the best collections together, hybridized and selected them, and really started the tulip on its way into our gardens.

The later trail of these plants is fairly clear. Barbequous, Austrian ambassador at the court of the Sultan of Turkey, there saw and admired the tulip and brought seed back with him when he returned to Vienna in 1554. From 1573 to 1587 the Dutch herbalist Clusius was the court gardener to Maximilian II at Vienna. There this excellent student of things botanical must have come into contact with the plant. Later, Clusius was professor at the University of Leiden (he died in 1609) and it was he who introduced a fine collection and popularized the tulip in Holland.

In Holland tulips soon became fashionable, so much so that by the early 1630's they had become the rage. Bidding for bulbs of the newly developed varieties was so spirited that it ended in a period of wild speculation. When the Dutch Government finally clamped down on this foolishness, certain rare bulbs were selling for as much as ten thousand dollars apiece. The worst period of this Dutch "tulipomania" lasted from 1634 to 1637. After the "crash" the growing of tulips settled down and became an honorable horticultural industry.

During the recent war it was reported that, because of the food shortage, the Hollanders were reduced to eating tulip bulbs. Unfortunate as were the circumstances which made this necessary, it did demonstrate what many of us have forgotten—that, like so many others, the tulip originally was valued as a food plant rather than for its flowers.

TULIP: The tulips we grow today are of two general classes, the "garden" and "species" tulips. Stated briefly, this means only that the "garden" tulips have been so mixed up by hybridization that plants of this group will not "come true" if raised from seed, whereas the "species" tulips, being somewhat nearer the wild types, will "come true" from seed. The differentiation no longer is completely true,

but gardeners still retain this general classification. *Tulipa Kantia undata* and *T. Clusiana* (the latter named in honor of Clusius) have long been favorites in the "species" class.

The "garden" tulips are of various type. Among the earliest becoming of these are the "Duc van Thol" group, thought perhaps to have been derived mainly from *Tulipa suaveolens*. The other types, the graceful "cottage" and stately "Darwin" tulips, are classified as *Tulipa Gesneriana*, but their real origin seems to be shrouded in the mystery of the various unknown wild forms brought together and hybridized in the early Turkish gardens. The "cottage" group takes its name from the fact that it has been the type popularly grown around European cottages since the introduction of the plant. The "Darwins" are more recent developments and were named in honor of Charles Darwin, who, among other things, was an experimenter and hybridizer of plants.

"Breeder" tulips also are often offered for sale and by some students of the genus *Tulipa* are thought to be a distinct group. Historically, however, the term "breeder" was applied to a self-color tulip (that is, to a tulip having a single color with no stripes, markings, or marginal frills) and produced directly by hybridization. Also, it is this type which usually is used in further hybridization or breeding. One of the mysteries of tulip culture is the fact that, after some years of staid behavior in the garden, a "breeder" sometimes is likely to "break up" into stripes and variegated markings. For example, the part-colored "Rembrandt" group is no more than a series of "breaks" which have occurred to various members of the single-colored "breeders" of the Darwin type. Having once "broken," the plant seems unable to return to the single-color "breeder" form. Another form is the bizarre "parrot" type; this is an ordinary tulip of the *Gesneriana* section with curiously frilled and often multicolored parts.

It has been impossible to present anything like a representative sample of the multitude of varieties of "garden" and "species" tulips now offered in the trade. Consequently, we shall not even name the ones shown on the opposite plate; some are old and some are new as next year's catalogue. If you are buying bulbs for your own garden, you will select them by the colored pictures in the catalogues anyway, where the different classes and varieties will be fully named. The word "tulip" was derived from a word meaning "turban," and that is enough to remind us that the turbaned Turks of centuries ago really started them on the long road to our own gardens.



Early before Holland, Tulip. Cultivated by Tulip. Whose Name Means "Turban"
 A. The tulip is the most common of the flowers, including the "parrot" Tulip, left, and
 the tulip, right, and toward the right with red and white parts an early garden form.

"In a Persian Garden"

WITH the steady increase in aridity throughout western Asia during the last 5,000 years or more, the peoples of this region were more and more forced to depend on irrigation for success with their plants. Pleasure plots of trees and flowers, when clearly apart from the irrigated fruit and vegetable gardens, of necessity had to be somewhat restricted in size.

This led to experimentation on the most economical spacing of the plants employed as well as considerable attention to the combination of species so that no part of a garden would long be devoid of bloom. Concentration on these details could lead to only one thing: raising of the art of gardening to an exceedingly high level.

Religion also often has played an important part in directing the trend of garden practices, and there certainly is no exception to this in western Asia. Those who held to the ancient faith of Zoroaster firmly believed that the Heaven to which they eventually would go was a Garden or Paradise. And the much later teachings of Mohammed did nothing to dispel this fundamental faith: in fact, Mohammed increased the number of Heavenly Gardens considerably. In addition to sparkling fountains, shade trees with wide-spreading branches, and banks of fragrant flowers, it was promised the Faithful that one of these Persian Paradieses would have attendants 'with complexions like rubies and pearls'; another was scheduled to be attended by brunettes 'with fine black eyes.'

To the old Persian, a Garden and Paradise were the same thing. And that is why Omar the Tentmaker could pay no prettier compliment to his ladylove than to say that if she would but sit beside him slogging in the wilderness it would be Paradise enough. Being an Oriental lady, she probably understood his desire for farther solace from a loaf of bread and jug of wine.

One thing the Koran forbade; that was the making of images. Therefore the gardens of the Mohammedan period were neither cluttered with statuary nor tortured with examples of clipped topiary work. The innate love of design and form which the Persians had was entirely concentrated on the working out of intricate patterns in the garden itself. Usually rectangular in shape, the garden almost invariably centered around a well, or storage pond—a necessity in a dry region.

Generally there were four main paths meeting at the well, these bordered by water canals. From these the smaller irrigation channels in turn led directly to the various plots. Because

of this necessary irrigation system in a relatively small space, the entire garden became geometric in form.

But those cold Persian winters shut the clammy tile doors of the homes! What, then, would be more natural than to cover those chilly tiles with warm rugs "when the rose is dead and the last bird flown"? To one who loved to stroll through his garden, the months ahead would indeed be drear. And so we can easily imagine some aged satrap ordering his rug weavers to make a copy of his summer garden, this to be placed upon the cold tile floor to bring him comfort and pleasure through the bleak winter months.

Such old Persian rugs still exist and may be seen in museums. In execution they are complete from the central pool, or well, to the paths and irrigation ditches, even to the individual trees and flowering plants. Some of these are so well done that we can recognize the species. Later these lesser details were stylized and became only parts of the general geometric pattern.

Many modern rugs, made today on mechanical looms, still retain the basic design: a central "pool" with the four main paths, two leading to the pool from the sides and two from the ends. If the border of the rug is of one type, it represents the tiled or pebble-strown path which surrounded the garden; if the border is of another type, its design goes back to the original pattern of trees and rose arbors which bounded the garden itself. Of the many kinds of flowers which the Persians grew, only two are shown on the opposite page; both are native in the Persian hills.

CROWN IMPERIAL (*Fritillaria imperialis*): Lifting its "crown" of green leaves to the height of two or three feet, this bulbous member of the Lily Family is a striking plant when in bloom. Originally the flowers were a rather dull yellowish red, but deep brick red and almost yellow garden forms are now known.

ORIENTAL POPPY (*Papaver orientale*): In the wild state, this showy and easily grown perennial has scarlet flowers with black centers. Garden forms now occur in various patterns and colors; some of these have been derived by hybridization with *Papaver bracteatum*, another species which occurs wild in Persia. Unlike other species of garden poppy, this group can be propagated from root cuttings. This has led to the production of a large series of handsome named varieties, many of which are cloned by the trade.



Persian Baza Bazaar, Tahir Gherman's Design from the Gardner's Quarried Park at
 the University of Cambridge, 1850. The illustration is a watercolor painting of a
 still life scene with a red flower, a yellow flower, a white vase, and a green object.

The Dutch and South Africa

THE Dutch East India Company was chartered in the year 1602. Its purpose was to open up trade between Holland and the Far East. All of this commerce was by sea around the Cape of Good Hope. In 1648 the *Haarlem*, a ship of the Company, was wrecked in Table Bay. The survivors landed near what is now Capetown. (They were picked up later by a boat returning to Holland from the Far East.) Fortunately saving a little seed which they chanced to have, during the five months of their enforced stay these shipwrecked sailors were able to have a small garden.

Scurvy was then common on long voyages, and the connection between a supply of fresh green material and freedom from scurvy and kindred ills was realized but not understood. We now know that vitamin deficiency is the cause, but all those old sailors knew was that they were more healthy on long voyages if they could get some fruit and vegetables from time to time. Realizing the potentialities of the Table Bay region, on their return to Holland they recommended that a garden be established at this halfway place where ships' crews could obtain these fresh foods. In 1652, two ships' companies set out from Holland with this object in mind.

Landing at Table Bay, they made a fortification and laid out a garden. The gardeners they brought along must have been good, for the project flourished. Being gardeners, they were interested also in the unknown plants they found growing naturally about them. They began moving these plants into odd corners of the vegetable plots.

And so began the real cultivation of the plants of South Africa, a region destined to play an important part in the development of modern ornamental gardening. By 1679 the original garden had been greatly enlarged so as to be able to include the host of ornamental materials flooding in from the up-country regions of Africa as well as the edible and ornamental plants brought by sea from China, Java, Zanzibar, and other points along the way. As early as 1700 these plants from the garden at Table Bay were common in Holland; from there they later found their way to gardens in other parts of the world.

CALLA (*Zantedeschia aethiopica*): For convenience in our series this plant has been called "Calla," following the usage of many who grow it; but the name really belongs to another member of the same family, *Calla palustris*, a delightful little plant of our northern swamps, often grown in bog-gardens.

More often it is called "Calla Lily," but this is worse. Most certainly the plant is not a lily; it belongs to the Arum family, of which our lowly Skunk Cabbage is a member in good standing, as also are the Jack-in-the-Pulnit, Elephant's Ear, Taro, Caladium, and more than 1,500 other species.

Also, the showy thing which looks like a flower is not a flower at all; it is a highly modified leaf surrounding a central spike on which are found the numerous small, closely packed flowers. But no matter what troubles this plant has getting us mortals to understand its structure and give it a proper name, it still is one of Africa's best contributions to our gardens. Several other African species of this genus with silver-spotted leaves, or with reddish or yellow spots, are also grown. The genus was named for Francesco Zantedeschia, an Italian student of plants of over a century ago.

STRELITZIA — PARADISE FLOWER (*Strelitzia reginae*): At first sight one of these bizarre plants in bloom is a botanical puzzle. The several flowers on each stem are enclosed by a much modified, boat-shaped leaf and come popping up in series, one after another. The three sepals of each flower are yellow, or in cultivated forms sometimes orangey. There also are three petals, one very small; the other two have been modified, swung forward into keels, and form the blue "tongue," in the groove of which lie the ends of the reproductive structures. This plant, a not-too-distant relative of the Banana, was named in honor of Queen Charlotte Sophia, of the house of Mecklenburg-Strelitz, wife of George III.

IMPATIENS (*Impatiens Holstii*): A native of tropical East Africa, this increasingly popular garden plant originally had brick-red flowers. Using its more vigorous and rapid growth, earlier blooming habit, and larger flowers as a base, hybridists have now given this species a wider range of tints, ranging from scarlet to salmony, pink and white, by hybridizing it with the otherwise less desirable *Impatiens Sultanii* of the Zanzibar coast. As noted, this species is taking the place of the old Garden Balsam, *Impatiens Balsamina*, a native of tropical Asia, which unfortunately hides its flowers under the leaves, requiring almost a worm's eye view to see them properly. *Impatiens Holstii* does not have this too-modest garden habit and so gets on a real show. Anyone who has pinched a ripe fruit pod of this group knows why the genus was named *Impatiens*.



Shipwreck and Scoury Fastened the Globe's Attention on Africa's Rich Flora

When the shipwrecked sailors were rescued, they brought back with them a few plants from the island where they were shipwrecked. These plants were the first to be introduced into Europe, and they were the first to be cultivated in the gardens of the rich.

A "Jolly Botanical Band" from Africa

WHEN the plant explorer sets down a record of his travels, he is fortunate to have some well-known personage to write a really appropriate Foreword. Consequently, when John Hutchinson, that distinguished student of African plants, now Keeper of Museums of Botany, Royal Botanic Gardens, Kew, England, was writing an account of various of his journeys in Africa—published in 1946 under the title of *A Botanist in Southern Africa*—he was doubly fortunate in having a friend who had been with him on one of these botanical expeditions who did this pleasant chore.

In the company of soldiers this personage is addressed as "Field Marshal"; around the council table in the deliberations of nations this older statesman is referred to as "The Right Honorable"; among botanists, who know and respect him as a keen and enthusiastic student of the plants of his homeland, he is called "Doctor." And so I quote from this foreword which Field Marshal the Right Honorable Dr. Jan Christiaan Smuts, Prime Minister of the Union of South Africa, wrote for Hutchinson's book.

In referring to a particular expedition he recounts: "What a jolly botanical band we were What busy days of collecting, wandering over the hills, climbing the mountains, nights by the wild fire, with the native dances to the beating of Africa drums, sleeping under the stars . . . ; camping by the ruins of Zimbabwe, by the smoke-mist of the Victoria Falls, by the shores of Lake Tanganyika and the banks of the Zambezi torrent rushing headlong into it. What joy to find plants never found before. . . ." It was a thrilling time, and some of us were invited into the mysteries of Africa in an experience which will surely never be forgotten."

What a "jolly botanical band" indeed! And how the good Dr. Smuts and his friend Hutchinson are to be envied this exciting trip together, hunting the remarkable plants of Africa.

POKER-PLANT (*Kouphonia*, several species): Of the more than 50 species of this tropical and South African genus available, the large-flowered *K. major* type and the small-flowered *K. foliosa* type are most often grown. It is unlikely that these species now are to be found in their original forms in gardens, for they have been hybridized with others of the genus and show considerable variation. The reddish forms are often called Red-hot-pokers or Torch-flowers. This genus belongs to the Lily Family.

GERBERA (*Gerbera Jamesonii*): Originally with predominantly orange heads, this spectacular member of the Sunflower Family has been broken up into many different color forms, a few of which are shown toward the left of the picture.

CAPE MARIGOLD (*Dimorphotheca aurea-virens*): Among the 20-odd species in this group of showy South African plants, some are annuals, some perennial herbs, and still others are shrubby. In our northern gardens this popular species comes into flower soon enough that it can be treated as an annual; farther south, where frost does not touch it, some strains persist and become somewhat shrubby. Thought originally to be yellow or orange, the flower heads of this species now exhibit a wide range of color; it seems likely that this is the result of hybridization between it and the much more variably colored *D. annua*.

LOBELIA (*Lobelia Friesii*): There is scarcely a region in the world where one is not likely to stumble on one or more of the 250 species of Lobelia known to botanists. In color they range from red, orange, and yellowish to violet, blue, and even white. Our native American Cardinal-Flower (*L. cardinalis*) is an example of one of the red ends of this floral spectrum. The smaller, dwarfish species seem to run more to blues than any other color and this South African species (*L. Friesii*) is no exception. Originally a rather diffuse and untidy plant, numerous low, compact, and floriferous forms have been selected so that today it is one of our most effective plants for edgings. Varieties of *Lobelia* now may be found in red, orange, yellow, purple, rose-crimson, or white. The foliage also ranges from pale to deep green, with some forms bronzy or reddish-tinged.

CASTOR-OIL-PLANT (*Ricinus communis*): There would be no excuse for snubbing this primarily economic plant into our series were it not for the fact that it is also popular as an ornamental object. In rich soil the plants grow rapidly and bring a truly exotic tropical note into our northern gardens. In the frost-free Tropics the plants become tree-like, specimens up to 40 feet high having been recorded. One of these is shown growing beside the concrete wall in its native setting. The stems and leaves vary somewhat in color in the different forms; in Mexico, where the plant is grown commercially, the forms with red-streaked deeply divided leaves are called "Palma Tronco"—Palm of Christ.



Among the "Mesquites" of Africa Are Abundant Species Yet to Be Discovered
 The illustration shows a variety of plants, including a large orange-red flower in the foreground, a pink flower, and a tall, slender, orange-yellow flower spike in the background. The garden is filled with various other plants, including green foliage and smaller flowers in shades of purple, white, and yellow.

More Africans, "Brought Back Alive"

IN MANY ways the plant hunter is very fortunate, for, unlike the animal collector, his "game" does not require elaborate traps. Furthermore, instead of hiding furtively or running away at the approach of the hunter, it often waves its multicolored banners in the air, seemingly attracting as much attention as possible, as, in fact, it is. Fortunately, the plant hunter usually has better eyesight even than the bee.

FRINGED HIBISCUS (*Hibiscus schizopetalus*): The usually sparse branches and scattered leaves of this shrub from tropical East Africa of themselves would scarcely be attractive enough to cause it to be grown in our frost-free gardens. Also, it is to be admitted that the flowers are not particularly abundant. But when even one of those buds, swaying on its long, pendent stalk, swells up and bursts open, the result is recompense enough for having carefully tended the plant.

PELARGONIUM or "GERANIUM" (*Pelargonium*, various species): There are upward of 250 species in the genus *Pelargonium*, most of them occurring in South Africa. But first let us try to clear up several items concerning the proper name for these plants. Although *Pelargonium* and *Geranium* are usually said to be the same, *Geranium* really should have another name. *Geranium* comes from the Greek word for "crane" and refers to the shape of the fruit; the true *geraniums* are often called Cranesbill.

Many of us are familiar with the common woodland *Geranium maculatum*, which sometimes is brought into gardens with success, and the even more familiar garden plant, *Geranium sanguineum*, a native of Eurasia. *Pelargonium* was derived from the Greek word for "stork"; again, the shape of the fruit has led to another common name, Storksbill. Although similar in general appearance, there is a technical difference between the flowers of *Geranium* and *Pelargonium* sufficient for botanists to keep the species in separate genera. Realizing this state of affairs and desiring greater precision, many gardeners are turning to the scientific names and call their plants either *Geraniums* or *Pelargoniums* to avoid confusion. It is a good idea; consequently, for the remainder of this note, I shall try to refer to these plants as "Pelargoniums."

A collection of wild Pelargoniums is interesting to examine. Many of them will look much like those with which we are familiar. Others will not. Since the group is native in South Africa, some species have ventured into the drier and semidesert areas and there taken

on different characters. Some of these have coarse, clubby, even spiny stems, looking very much like cacti. Also, like the cacti, some of these desert Pelargoniums have almost lost their leaves, the thickened green stems having taken over the function of leaves and also acting as water-storage organs during periods of drought. Other species which favored moister conditions became leafy, trailing, or scrambling vine-like plants.

In many of the erect-growing leafy species the plants have a strong odor, leading to such names as Apple, Rose, Lemon, and Nutmeg. "Geraniums" (or Pelargoniums!). Because of considerable hybridization in the past, it now is extremely difficult to decide just which of the wild species were ancestral to our cultivated forms. The most frequently grown is the Fish-Pelargonium; this is the common "Geranium" of pot and window-box culture. Lacy in its many color phases it is used also as an effective bedding-out plant. In southern Florida and California it will grow year after year, forming great woody plants which, if carefully pruned and trained, can be made to cover fences and trellises.

GLADIOLUS (*Gladiolus*, various species): The 200 or more species of this important garden group are scattered from the Mediterranean southward through Africa, the greatest concentration being in the Cape region. Except in a few collections brought together from the wild, none of the material grown today looks very much like the original species. Like *Pelargonium*, the genus *Gladiolus* has been a fertile field for the hybridist so that, today, they come in such a wide variety of forms and colors that there is no use here to attempt even an introduction to a subject about which a whole book could be written. When Linnaeus christened this genus about 200 years ago, he did not have our modern showy flowered plants to study and apparently was more impressed with the shape of the "swordlike" leaves, consequently, he used the name *Gladiolus*, from the Latin, meaning "little sword." The word "gladiolus" comes from the same base.

AFRICAN-VIOLET (*Santhalia ionantha*): This charming blue-flowered African plant was named in honor of its discoverer, Baron Walter von Saint Paul. The plants may be grown from seed but usually are propagated from leaf cuttings. Although Africa does have its native true violets, this is not one of them; the African or Usamburua-Violet is a member of the Gesneria family.



Plant Marvels of Madagascar

BROWSING through certain "travel" books of a century or more ago, written from hearsay and legend with no personal knowledge of the countries concerned, the reader is likely to stumble upon weird fables such as: "Madagascar, home of the Poison-gas-bush—a shrub which exhales so insidiously poisonous a vapor that birds, merely flying through its branches, fall dead." Or, "Mysterious Madagascar, land of the voracious strangler tree: a tree whose prehensile branches quickly encircle the unwary passer-by, holding and crushing them until they die; then the tree slowly proceeds to devour the victims, leaving only bleached and whitened bones." This yarn keeps popping up frequently and only recently I got numerous inquiries, asking if it really were true, for it had been alluded to in a well-known radio program.

Naturally, plant explorers long ago explained these wholly untrue myths. Even so, Madagascar does have many vegetable curiosities; perhaps nowhere is there a land more full of botanical surprises. Unfortunately, relatively few of them are menable to garden culture.

FLAMBOYANT or ROYAL POINCIANA (*Delonix regia*): Being sensitive to frost, this magnificent flowering tree is mainly a plant of the Tropics; yet it is commonly found in gardens, parks, and along the streets in the southern parts of Florida and California. Fortunately, indeed, are those who can grow it in their gardens. Some years ago when I lived in Haiti there was an old Flamboyant beside the house, a guarded relic of French colonial days. Seemingly overnight its contorted and mostly bare branches burst into what looked like scarlet-orange flame.

One day as I stood there looking up in wonder at the sheer magnificence of the scene, a flock of small birds came tumbling out of the sky and settled for a while among the gorgeous flowers. It was early spring, and I recognized them as warblers hurrying northward by way of the island steppingstones of the Caribbean from their winter homes in the South American jungles. After a pause to catch their breath, as well as a good meal of insects, the warblers flew on toward their nesting places in the cool forests of New England and Canada. The old Flamboyant stayed behind, as it had for countless other spring-times, nodding its head drowsily in the Haitian sun, almost as if it were dreaming of its real home on the faraway, hot plains of Madagascar.

CROWN-OF-THORNS (*Euphorbia Millii*; *E. splendens* of florists): This species is grown as a pot-plant in our homes in winter, to be set outside in the summer months. In our southern gardens, where protection from frost is assured, it takes its place with other decorative, sun-loving plants. The gray spiny stems with their few green leaves would be interesting of themselves, but the peat scarlet or orange-crimson "flowers" are the real attraction. The word "flowers" must be used with caution in this group of plants, for, like all Euphorbias, the objects which look like petals are bracts, in reality lightly modified and sometimes grandly colored leaves surrounding the real flowers. We shall meet another Euphorbia with an even more showy display of these petal-like leaves when we come to the Mexican *Poinsettia* (pages 56, 57).

The Crown-of-Thorns has long been associated with an interesting legend, for, as its common name implies, it is supposed to have played a part in the humiliation of Christ just before His crucifixion. With its name and sinking tradition we therefore find that artists not infrequently picture this plant when depicting scenes of Biblical times. Although the plant is found today in gardens in the Holy Land, there are excellent reasons to suppose that it was not present there 1,900 years ago.

Such botanically unwary artists also are fond of including pictures of cacti when painting the rough and thorny paths trod by the saints and prophets of old. The cacti are wholly American and, like the Crown-of-Thorns from Madagascar, were introduced into gardens. Finding the climate suitable there, they slowly have escaped from cultivation and now are well established in parts of Palestine, appearing to be parts of the native flora.

TRAVELERS-TREE (*Kalanchoe pinnatifida*): Because of its curious appearance and remarkable two-ranked leaves, the Travelers-Tree is grown in many of our gardens. It is a close relative of the *Succulias*, a series of which appears in one of the African pictures of this series (page 33). Unfortunately, the flowers of the Travelers-Tree are not so showy as those of its relative. The common name of this plant is suggestive of its use, for, if one will bore a hole through a leaf base near its juncture with the stem, up to a pint of reasonably good drinking water will come welling out. The Flamboyant, the Crown-of-Thorns, and now the Travelers-Tree—truly an exotic trio from faraway Madagascar—land of botanical surprises.



Madagascar Yachin Botanical Services, Yields These Three Types for Horticultural Gardens
 Yachin Botanical Services, Yields These Three Types for Horticultural Gardens
 Yachin Botanical Services, Yields These Three Types for Horticultural Gardens



Living Age Tropical East Asia Grew These Gorgeous Ponds to Satisfy Man's Hunger

From Tropical Southeastern Asia

MANY delicious plants in the garden that man has lived in southeastern tropical Asia for a very long time. In the jungles of Ceylon, Burma, and elsewhere are ruins of ancient temples, indicating a once-great civilization. Yet even before these temples were built, the peoples of southeastern Asia and adjacent island areas had been cultivating plants for thousands of years.

Since it is a trial-and-error affair, it is impossible to estimate the length of time necessary for a primitive people to find and domesticate the plants necessary to support a civilization. Yet when history first opens on these peoples, already they had found and developed such basic food plants as rice, sugar cane, various beans, the egg-plant, cucumber, taro, yam (the true yam, not the sweet potato), plantain, and coconut. And for fruits they had such things as the banana, pomelo (the ancestor of our grapefruit), and mango. On the picture above are three of the most important plants, all of which seem to have been associated with the peoples of southeastern Asia first as foods.

EAST INDIAN LOTUS—(*Nelumbium* *Nelumbia*): This majestic water lily goes under many erroneous names in garden catalogues, one of the most frequent being "Egyptian Lotus." The real Egyptian Lotus is a different plant, with large floating leaves. Botanically, this native African water-lily is a species of *Nymphaea*. Furthermore, even this plant is wrongly named, for the fruits supposed to have been eaten by the *Lōtophāgoi*, or Lotus-Eaters of Greek legend, did not come from the "Egyptian Lotus" but from a shrub apparently of the Cretan coast on the south shore of the Mediterranean. What the original true Lotus might have been is quite another matter, which need not concern us here. But it does seem rather a pity that we struggle along with all sorts of silly invented names for this plant (I have seen some really weird ones in catalogues in the last 15 years) when all the time we have had a perfectly good one concealed in its scientific name. For the botanical name *Nelumbia* was directly derived from its native name in Ceylon.

It is doubtful whether the early primitive peoples of southeastern Asia were greatly interested in the beauty of this flower. They first cultivated the plant as food, and the people there still make considerable culinary use of both the large tuberous rootstocks and the nutlike seeds. The appreciation of the plant for its beauty came only after the rise of the great Asiatic cultures and their interest

in the growing of flowers. This plant now grows in Egypt, but seems to have been introduced there from tropical Asia by the ancient Roman rulers as a food source for the people during famines.

HIBISCUS (*Hibiscus*, several species): The red flower in the upper corner of our picture is *Hibiscus Rosa-sinensis*, or Rose-of-China, the buds of which are still used in curries and soups. Early travelers found this plant growing in the gardens of southern Cathay and other parts of southeastern Asia and prized it for its beauty. Much later the East African Fringed Hibiscus, *H. schizopetalus* (page 37) was taken to Asia, where these two species became hybridized. Today, in tropical and semitropical regions the offspring of these plants are grown in their original forms, as well as all imaginable hybrid combinations with fluted and crinkled petals.

However, those of us who sigh for such colorful plants in our northern gardens need not be discouraged. We have three or four species native in eastern North America which, in their modern garden forms, put on a show possibly even surpassing that of their tropical relatives. Why these completely hardy and brilliantly colored American forms of *Hibiscus* (called Rosemallow in the trade) are not more often grown is a puzzle. Probably if they came from some distant land nurserymen would be unable to keep enough in stock to supply the demand.

The other flower peeping into our picture is the Yellow Hibiscus, *H. Manihot*. This one can be grown from seed and handled as an annual in our gardens; with proper care certain selections will produce flowers six to nine inches in diameter. One of the short pods of this species is shown. In the Old World Tropics there is another very closely related plant which has relatively small flowers and much larger pods. I think that these two once were the same species and that the peoples of southeastern Asia grew the ancestral form in their vegetable gardens. Then, in the dim past, variant strains were selected, one for the size of its flowers, the other for the size of its edible pods. This small-flowered, large-podded plant, now classified as *Hibiscus esculentus*, is the popular garden vegetable which we grow under the name of Okra or Gumbo.

Modern chickens trace back to the wild jungle fowl of this same region, and rice is also native there. Our gumbo-chicken-ricer soup is not American in origin; it is a direct descendant of one of the native dishes of these ancient peoples of southeastern Asia.



Photographs of China Sea Island Peonies — Grace Our Gardens

The first of these is the 'China Sea' variety, which is a very large, double flower, with a very full, rounded shape. The petals are a deep pink color, and the center is a lighter shade. The second is the 'Grace Our Gardens' variety, which is a smaller, single flower, with a more delicate shape. The petals are a light pink color, and the center is a pale yellow.

Chinese Mountainsides Yield Treasures

SOME years ago in tracing the origins of certain economic and medicinal plants I had translated parts of an ancient Chinese work written by Sheng-Nung, an excellent Chinese gentleman who lived somewhat over 4,000 years ago. What struck me so forcibly was not that the Chinese were cultivating plants at so early a date, for theirs is an ancient civilization, but that already they had selected and named so many varieties. This could mean only that they had been cultivating these plants for many centuries before the time of Sheng-Nung.

We know little of the early development of ornamental gardening in China, but when Marco Polo, the Venetian, journeyed to China between A. D. 1272 and 1293 and visited the court of Kubli Khan at Xanadu he was amazed at the splendor of the gardens and the wealth of plant material they contained. During previous centuries many of these plants had wandered down the old trade routes to Persia, from whence they had been introduced to Europe. Even so, on his return the people of Marco Polo's day refused to believe his account of what he had seen in Chinese gardens.

No civilization of any stature has yet arisen which has not developed ornamental gardens of some sort. The ancient Chinese gardeners were especially fortunate, for perhaps nowhere in the Temperate Zones is a region more rich in potential ornamental materials. Also, China is large and has a varied terrain with different soil types and contrasting climates, each with its own set of species. And that is all in our favor, for this makes it possible for us to choose from among the many excellent Chinese species those which will fit almost every type of climate and soil we have.

REGAL LILY (*Lilium regale*): Let us first "consider the lilies of the field; they toil not . . ." But how we ourselves toil bringing them into perfection in gardens! With its nearly 100 wild species there is scarcely a region in the Northern Hemisphere where the genus *Lilium* is not present. So striking is this plant that everywhere it grew wild it was brought into gardens. In choosing a lily to represent China, one might easily have taken the old Tiger Lily (*L. tigrinum*), when, with its tawny-red flowers splashed with purple black, is perhaps the most widely grown species in the genus. Or we might have chosen—but why go down through the list of Chinese species? Let us just take the Regal Lily, thought by many growers to be the Queen of the genus.

But have you ever seen Humboldt's Lily growing wild in the Sierra Nevada north of Yosemite, or the towering *Lilium superbum*—I've seen it with as many as 40 flowers on a single plant—in its natural setting in the spruce-firwood glades of our southern Appalachians? But the Sierras and the Great Smokies are not in China.

ABELIA (*Abelia grandiflora*): In selecting a shrubby member of the Honeysuckle Family from China we might have chosen any one of several excellent flowering Honeysuckles. Also, there is the increasingly popular *Viburnum Carthagen*, with its trusses of fragrant white bloom; but actually it is Korean. And what about the showy "Weigelas"? Botanically, they are Diervillas, and *D. florida* from North China has brought real hardiness and a deep rose color to our modern garden hybrids. But the "Weigelas" bloom early and their beauty fades all too soon. Lastly we come to the Abelias. Here none of the wild species has been chosen for our planting; instead we have a garden hybrid, *Abelia grandiflora*, which combines the most desirable qualities of its several parents. Not too choosy about soils, partly evergreen, usually compact and graceful, and carrying a nearly constant display of flowers from June until heavy frost, often into November, *Abelia grandiflora* certainly is a desirable flowering shrub. It is the work horse of the shrubby border and more than carries its load during the late summer vegetative doldrums when so many shrubs seem merely to be loafing. The genus was named in honor of Clarke Abel (1780-1826), physician and author, who lived in China.

PEONY (*Paeonia*, various species): The Chinese have been cultivating the Peony for some thousands of years and long ago selected many varieties. It was one of their favorite flowers and writings of over 800 years ago record large collections, one Peony enthusiast having 60,000 plants in his garden. Originally with 5 or perhaps 10 petals, the double-flowered forms have been derived by the progressive sterilization of the stamens, accompanied by the enlargement of the filaments into colored petal-like structures. Two main types are grown, the common herbaceous peonies and the increasingly popular "tree" peonies, the latter actually shrubby plants seldom over four or five feet tall. Recent advances in the science of plant breeding have enabled us to make hybrid combinations never produced before, and so we now can look forward to a whole new series of forms in this genus.



From China, Scores of the same These Other Plants Now So Found in the West
 and from the East, the same plants are found in the West, and from the East,
 the same plants are found in the West, and from the East, the same plants are found in the West.

More Plants from Age-old China

THE TEA PLANT is an old Chinese story, having to do with a wanderlust, which tells us that he who is too fond of waterfalls need not travel far just to listen to the ocean, for water makes much the same sound whether dashing against a rocky shore or pouring over stones. The old ends: "Furthermore, when you are away, who will tend your garden?"

CAMELLIA: Although introduced into Western gardens mainly by way of Japan and therefore known under such historically misleading names as *Camellia japonica* and *C. sasanqua* (the latter derived from a Japanese vernacular name), it would appear that the basic species from which our garden Camellias have been derived, for the most part, can be traced back to forms once wild in China. Botanically, the Tea Plant is very closely related to the Camellias; it also is Chinese.

HOLLYHOCK (*Althaea rosea*): Rearing its snowy spikes of flowers in our midsummer gardens, this species now comes in so many shades and forms that our grandmothers scarcely would recognize this old favorite.

CHINA ASTER (*Callistephus chinensis*): In its wild form this species has a single series of petal-like, purplish blue ray flowers around the margin and a large number of small yellow flowers in the center of the head. Cultivated "double" forms are now generally seen. Selected types vary greatly in color, but for some reason no really yellow forms are known. The name of this species is not just something invented by botanists to make things more difficult; like all scientific names for plants, it means something. *Callistephus* is the Greek for "beautiful crown" and *chinensis* means "living in, or from China." Hence this plant might well be called "The Chinese Beautiful-Crown."

BLACKBERRY-LILY (*Belamcanda chinensis*): This plant, shown in the lower foreground of our picture, once almost disappeared from gardens. Thanks to workers who now have given us a wider variety of color forms and larger, more showy flowers, this old favorite is making a comeback and promises to be popular again. Its common name is derived from the blackberrylike appearance of the ripe fruit after it splits open, exposing the black seed; one of these fruits is shown. However, the plant is neither a "blackberry" nor a "lily"—it is a member of the Iris Family. And that is why botanists often look askance

at the common names of plants; not only are they sometimes incorrect and misleading, but they may vary greatly from place to place. Why not end this pretty flower by its real name? After all, it is only a slightly modified (and for us spellable and pronounceable) form of the name it has carried for untold centuries in its native home. Split the syllables—bel-am-**CA**-da—and repeat them slowly until the natural music they make becomes familiar.

CHRYSANTHEMUM. Back against the wall in our picture is a bed of Chrysanthemums, one of the countless forms in which this great group of showy plants occurs. Merely for convenience in classification, botanists have put the garden and forests' "Mums" into a single species *Chrysanthemum morifolium*, but they have been grown and hybridized for so many centuries that there now seems but little chance of determining exactly from which of the wild species they have come. All we know is that, primarily, our modern garden "Mums" are of Chinese origin.

CLEMATIS (*Clematis lanuginosa*): Scrambling over the wall is a plant of this, the largest flowered of all known wild species of this remarkable genus. In combination with the somewhat more lively-colored species, such as the southwestern Asiatic and southern European *C. recta* and the Japanese *C. patens*, this Chinese species has been the most important parent of the present large-flowered hybrid garden forms such as the long-popular Jackson's Clematis and many others. Frost-free gardens have their own special kinds.

FORSYTHIA: Although occasionally called "Golden Bells," here is an instance where the scientific name *Forsythia*, actually is more often heard than the so-called common name and has become almost standard usage. Two species are grown, *Forsythia viridissima*, and the somewhat pendulous-branched *F. suspensa*, as well as their hybrid, *F. intermedia*. It would be difficult to explain to a gardener how the early, spring-flowering Forsythia got into this picture with mainly late summer bloomers. Actually, we got tired having him around—he's such a common and persistent fellow—and chased him away several times. But just as the picture was finished we noted that he had sneaked back again and stuck his head through the Moon Gate, almost as if he were hissing in old vibrant Mandarinese: "You don't dare leave me out of this! I'm Chinese too!"



Japan Domesticated Its Own Windflowers and Improved Its Neighbors

It has been a long time since we have seen a picture of a Japanese garden. The Japanese have been very successful in their efforts to improve their own and to share their knowledge with the world.

Patient Gardeners of Old Japan

IN a north-south direction the islands of Japan cover about the same amount of latitude one finds journeying from New England to Florida. Toward the south where the winters were mild there could be a continuous succession of flowers, and there the Japanese had a floral calendar marked by different species. The Japanese calendar was so arranged that New Year's Day fell in our February, just as the first Plum blossoms opened. These were followed in March by the Peach and Cherry. May brought the *fuji*, or Wisteria. June was made beautiful with Irises and Peonies. In July came the East Indian Lotus. The late summer—August and September—was marked by various kinds of Hibiscus, with autumn being heralded by the October Chrysanthemums. And the winter months, closing out the Japanese year, were the time when the Tea Plant and various Camellias bloomed.

Patience of patience in a craft where patience is a cardinal virtue, the old Japanese gardeners with their keen eyes for selection gave to the world a long series of choice ornamental varieties. Although working primarily with their native materials, the Japanese made free use of other species, so that Japan is the actual door through which many Chinese and other Asiatic species came to us.

JAPANESE WISTERIA (*Wisteria floribunda*): This strikingly beautiful member of the Pea family has long been a favorite and in the hands of Japanese selectors has yielded numerous garden forms. In its original state the flowers apparently were purplish and in clusters (called racemes) less than a foot long. By careful selection the basic colors have been separated, intensified, or diluted to pastel shades, and recombined by hybridization so that the tints now range from deep violet to light blue, rose, pink, and white.

Other selections yielded plants with racemes up to 3 or 4 feet long; this showy group, designated variety *macrobotrya*, also has numerous races varying in the color, size, and shape of their flowers.

Several Chinese species also are grown, such as *W. sinensis*, with its either blue-violet or white flowers, and *W. venusta*, with its large white flowers on short racemes. Native American Wisterias, as *W. frutescens* of our own Southeastern States, and *W. macrostachya* of our South-Central States are sometimes cultivated.

The genus *Wisteria* was named in honor of Caspar Wistar, 1761-1818, professor of anatomy in the University of Pennsylvania. The

slight change in spelling may be no more than an attempt on the part of the original namer of the genus to arrive at a somewhat more euphonious Latinized form of the original.

BLEEDING HEART (*Dicentra spectabilis*): This Japanese member of the Fumitory Family has long been popular and is found in many American gardens. As its name rightly indicates, it is the most spectacular member of the genus. Like many North Temperate genera, *Dicentra* has wild species both in Asia and in North America, the two American species, increasingly frequent in gardens, being *D. formosa* of the Pacific coast mountains and *D. eximia* of the southern Appalachians. Another American member of this plant family, *Adonis jugoslavica*, known in various regions as Allegheny-Vase, Climbing Tumbler, or Mountain Fringe, is also commonly planted.

JAPANESE IRIS (*Iris Karmapheri* and *I. laevigata*): In the wild, *Iris Karmapheri* is said to have reddish-purple flowers and *I. laevigata* blue ones. Although usually sold under the name of *Iris Karmapheri*, apparently both species (and probably others) are involved in the present races of this complex and variable group of plants. Long grown in its native home, the Japanese have hundreds of named varieties; in recent years our own Iris breeders have added many more.

AZALEA (*Rhododendron*, various species): As will be noted on page 65, the Azaleas, botanically speaking, belong in the genus *Rhododendron*. A clump of Japanese Azaleas is shown in our picture near the stone lantern. Its showing here honors those old Japanese gardeners who produced so many fine varieties, both in the evergreen and in the deciduous-leaved groups. The so-called "Japanese" Azaleas, for the most part, are the result of hybrid combinations between native Japanese species and some introduced there from China many years ago.

In our picture a few artificially dwarfed trees also are shown. One of these is the pine. Several species were used, but the Japanese Red Pine seems to have been one of the favorites. The other is the Flowering Cherry. The subject of Japanese Flowering Cheries is too large to be discussed here, but various botanically distinct species in their many garden forms and apparent hybrids were available. Japanese gardeners also made use of the Flowering Almond and the Peach, both native in China, in the production of these dwarfed flowering-tree specimens.



Australia, First Introduced Continent of Discovery, Gave the World Many Interesting Plants
Left: Bushy Tree, Right: Blue Lace-Flower, (Pleurophyllum
and other plants from Australia, and other plants from the United States, brought to the United States

Australian Plants and Geography

THOSE of us whose business it is to study the natural distribution of plants are intrigued by those of Australia. Many plant groups of this continent have close connections elsewhere, for example with those of Africa, and by way of Tasmania and New Zealand with those in southern South America. These relationships are so close that we are forced to the conclusion that at one time Australia was in some way connected by land with these areas now separated by thousands of miles of ocean.

Later, Australia became isolated from the rest of the world—and for a period sufficiently long that on it were developed characteristic and often peculiar species of animals and plants. The great number of new plants and mussels of the world to be discovered, Australia had many excellent items for gardens which now are widely grown.

In 1768 Sir Joseph Banks and his associate Daniel Solander (southern gardeners remember him in the genus *Solantra*) sailed with Captain Cook on the first of his memorable voyages. From the region about a certain bay in Australia they collected a thousand different species of plants. With a nearly blank map before them the temptation was too much and so, to commemorate this great haul, the place was named Botany Bay.

EUCALYPTUS or GUM TREE (*Eucalyptus*, various species): The approximately 300 species of *Eucalyptus*—one of which is shown in the distance in our picture—are mainly Australian. Being trees primarily of warm areas, they have been widely planted in tropical and subtropical regions. Some are rapid growers and yield firewood and lumber in a comparatively few years. In parts of South America where the forests have been denuded by thousands of years of human occupation, *Eucalyptus* has been introduced and in various places is almost the only tree seen on the landscape for miles. Certain species, as the Blue Gum (*E. globulus*), are often grown in California and to some extent in Florida. In its home in Australia the Blue Gum may reach a height of 300 feet.

Other species are naturally lower growing and often strikingly ornamental. Some bear bright scarlet or pink flowers (e.g., *E. ficifolia*), and others have curiously shaped, grayish silvery leaves (e.g., *E. polyanthemus*).

In all, about a dozen species are regularly cultivated in California, and many more are available from nurserymen. Because of the unusual shapes and colors of the leaves, especially on young shoots, branches of various

species are now harvested commercially and often seen in florists' shops. The *Eucalyptus* belongs to the Myrtle Family.

This large family of plants, with about 75 genera and 3,000 species, has many horticultural members, of which the true Myrtle of the Classical Period—and native around the Mediterranean—is only one. Those who live in tropical or subtropical regions are likely to have growing in their gardens such interesting fruit trees of the Myrtle Family as the South American *Pitanga* or Sorium-Cherry, the Malayan Rose-Apple, the Australian Brush-Cherry, the East Indian Jamblan-Plum, and the tropical American Guava.

Olives are the flower buds of one member of this family native in the Moluccas, and Allspice is the dried, unripe berry of another found in the West Indies and Central America, whereas bay rum is distilled from the leaves of still another native in the Caribbean and northern South America.

BOTTLE BRUSH (*Callistemon rigidus*): This also is a member of the Myrtle Family. There are about 25 species of this showy Australian genus of shrubby trees, some with wider and others with narrower leaves than the one shown at the top of our picture. The closely related and quite similar Australian Cajuput-Tree or Punk-Tree (*Melaleuca Leucadendron*), with its dense clusters of creamy white flowers, is often planted in Florida where it has escaped and in places become weedy.

STRAWFLOWER (*Helichrysum bracteatum*): The Strawflowers are so common that we are inclined to forget that their native home is Australia. Cut at the proper stage as they open and hung upside-down to dry, they make excellent "everlasting" winter bouquets. The name *Helichrysum* was most aptly compounded from two words meaning "sun-gold."

SWAN RIVER DAISY (*Brachycome iberidifolia*): Named for its native region in Australia, this pretty and easily grown annual is worthy of a place in any garden.

BLUE LACE FLOWER (*Trachymene coerulesca*): Sometimes erroneously listed in seed catalogues as "*Disiscus coerulesca*," this delicate Australian is often grown as a garden decorative. It is a close relative of the European Queen-Anne's-Lace (*Daucus carota*), which is now a common weed in our vacant lots and old fields.

South America Rich in Plant Life

I F YOU were to stand on the shore of the Pacific in Peru, only the projecting tips of Maine and Florida would dip into the Atlantic on the opposite side of South America. Lengthwise, Washington State would be a thousand miles south from the Caribbean and California about 2,700 miles north of Cape Horn.

The basin of the Amazon River has almost the same area as the entire United States and is rarely more than a few hundred feet above sea level; yet its western boundary is marked by one of the highest continuous mountain ranges in the world, the culminating peak, Aconcagua, being 23,081 feet above the sea. It is so high that for a distance of some 4,000 miles almost nowhere is there a pass lower than 10,000 feet.

Such is the magnificent scale upon which South America has been built. Its climates are extremely varied. Snow-capped mountains rise up out of equatorial jungles. Parts of the eastern slopes of the Andes are among the world's wettest regions, while segments of the narrow coastal strip, relatively only a few miles away on the western side of this range, are among the world's driest.

The complexity and abundance of the plant life of this great continent match its geographical diversity. Many of these plants have been brought into our gardens. In their native haunts the majority are perennials. Some, like the Fuchsia of our plate, must be treated as such and are best grown from cuttings; others, such as the rest of those shown opposite, although still potential perennials, bloom soon enough from seed so that we can handle them as "annuals" during our short growing season in the north. As a result, they have long been popular garden subjects.

FUCHSIA (*Fuchsia*, various species): The numerous species of this member of the Evening-Primrose Family are mostly shrubby. They are primarily South American in origin, with a few venturing naturally as far north as Mexico; three or four species also are found in New Zealand. The galaxy of forms encountered in the Andes is a source of never-ending wonder to the plant collector.

Some of these have delicate little bell-like, crimson flowers less than an inch long, and I have seen plants ten feet high covered with masses of salmony red flowers up to four or five inches long. The one shown in our picture is a form of *Fuchsia magellanica*, the original of which is native from Peru southward to the bleak hills of Tierra del Fuego. Because of this, certain varieties of it, with

some protection, are reasonably hardy outdoors at least as far north as New York.

Closely related forms occur northward through Central America. They will not stand frost. The majority of decorative Fuchsias which one sees are hybrids, probably between forms of *F. magellanica* and the more showy Mexican *F. fulgens*. The genus was named in honor of Leonhard Fuchs, an eminent botanist who lived from 1501 to 1566.

PETUNIA (*Petunia hybrida*): As the name implies, our garden Petunias are hybrids, the parent species being the white *P. axillaris* and the purplish-violet *P. violacea*, both originally from Argentina. A "sorting out" of the basic colors which, in combination, gave the purplish tint to the wild *P. violacea* has produced the bluish and rosy pink forms of our modern garden plants; the white forms hark back to the *P. axillaris* ancestor.

VIP-FLOWER (*Nerthembergia*, several species): Two species of this are frequently encountered in gardens, the dainty Brazilian *N. gracilis* and the more robust Chilean *N. frutescens*. The latter also is often grown as a somewhat shrubby, much branched, pot plant. The genus was named in honor of John Eusebius Nieremberg, first professor of natural history at the University of Madrid.

The Nierembergias and Petunias belong to the same plant family as the Potato, Tomato, and Tobacco. Other South American members of this same family which might have been included here are Salpiglossis, Schizanthus, Ipomoea, and the sometimes foot-long Angels Trumpet.

GARDEN VERBENA (*Verbena hortensis*): Again, as is so often the case, the garden forms of a group are not referable to any one wild species. In this instance, one of the principal parents seems to have been a scarlet flowered species wild in Argentina and southern Brazil, but now hybridized with a purplish-flowered species from southern Brazil and Paraguay and a whitish-flowered species widespread in parts of northern South America. The result being the present wide range of available colors in the modern Garden Verbena.

SCARLET SAGE (*Salvia splendens*): In its native haunts in Brazil this common garden plant is a shrubby perennial with scarlet flowers. Quick-blooming forms with the flower color also present in adjacent parts of the plant are now available, varying from the original color to crimson, purple, or even white.



Some Old Favorites Trace Their Ancestry to South America's Plains and Andes

Many of the flowers in our garden borders—its delicate pendant bell, a most French Garden Verbena, Petalio
 and the red—by the all Cup Flowers that are so common in the garden.

From South American Jungles

IT SEEMS as if we could find in the South American Jungles could have anything to offer in the way of plant materials for our northern gardens; one would think that our climate is not suitable. The plant explorer sometimes has difficulty convincing others that the temperatures and humidity he can witness in the jungle usually are no greater than one sometimes endures with only minor discomfort in a midwestern harvest field or in a suburban back yard along the Atlantic coast in July or August.

Actually, our northern summers may be quite as "tropical" as much of the South American jungle; one sometimes is inclined to think even more so. And that is why a goodly number of our common garden plants, especially among the "annuals," come from there, as—ah!—in some of the pestiferous weeds which vie with them for space along our garden paths.

SPIDER FLOWER (*Clematis spinosa*): This increasingly popular garden plant is a member of the Caper family; its common name is derived from the spidery appearance of its wide-spreading stamens. Spider flowers usually come in light, rosy-purple shades, but white and pink forms are now fairly common. The pinnate foliage suggests just a little of the primal and earthy colors so characteristic of its jungle home.

MORNING GLORY (*Ipomoea*, various species): There are, around the world, about 400 species of wild Morning Glories, a large number of them being native in the American Tropics. In their native haunts many of these are rampant weeds, or soon become so if agriculture is attempted where they grow. All of the true Morning Glories belong to the genus *Ipomoea*; in color they range from red (rarely) through purple and blue to white, with occasional mottled and striped forms. Many of the wild species at one time or another have been brought into cultivation and have been used by hybridists in the production of some of our modern garden types, yet the two most often grown are the common *Ipomoea purpurea*, usually seen in purplish-blue shades, and the light blue garden form of *I. tricolor*.

Although we commonly grow another "Morning Glory" in our northern vegetable gardens and fields, it seldom is recognized as such. This plant is *Ipomoea Batatas*, the common Sweet Potato. It rarely flowers in the north, but in its home in the South American jungles the pretty blue flowers on long trailing vines are abundant and trimmable.

CYPRESS VINE (*Quamoclit pennata*): This dainty scarlet-flowered, finely cut-leaved climber has long been a garden favorite, but it is now somewhat less common than the Cardinal Climber. The Cardinal Climber is a hybrid between the species shown here and another with coarse and waxy-leaved leaves, *Quamoclit coccinea*. Both of these parent species are now found in our southern States, probably as escapes from gardens. The Quamoclit is close relatives of the Morning Glories.

NASTURTIUM (*Tropaeolum majus*): There are some 50 wild species of wild Nasturtiums ranging throughout tropical America from southern Mexico to Chile. Various of these have been hybridized, usually just enough to produce a certain color or color combination; rapid growth and an early, free-flowering habit—so necessary for success in our northern gardens—have been obtained primarily from the wild, yellow-flowered *Tropaeolum majus* ancestor. Double-flowered forms are now obtainable in various colors.

VICTORIA WATERLILY—Although generally sold under the botanical name of *Victoria Regia*, the plant usually turns out to be another species, *Victoria Cruziana*; both of these are South American. Although the bloom is showy, this tropical waterlily is grown more for its enormous leaves with their curiously up-turned margins than for its flowers. With leaves up to 6 feet across, the Victoria Waterlily admittedly is scarcely a subject for "tub or half-barrel culture" or even the usual lily-pool in a suburban back yard; with ample space it will provide quite a show.

CANNA: Growing along streams or at the edge of the forest, as shown here in the picture, wild Cannas—of which there are quite a few species, some with red and some with yellow flowers—often form a characteristic part of the American jungle scene. The old Indian shot (*Canna indica*, not from India but actually an American species), with its bright-red but small flowers and coarse "leaky" growth, is now passing out of our gardens, and its place is being taken by the newer large-flowered hybrid forms with rather more compact growth habits. The floppy-flowered *Canna flaccida*, wild in the Florida Everglades and the Georgia coastal swamps, in combination with other more tropical American species, has contributed much to the development of the modern "border-flowered" hybrid garden Cannas. The large parts of the Canna flower which look like petals are sterile, petal-like stamens.



North America's Purple Deadnettle Enjoys the Heat and Humidity of Our Northern Summers.
 A tall, slender plant with a green stem and pointed leaves, topped with a cluster of red, tubular flowers.
 To the left, a large, light blue flower with a yellow center is in bloom. In the foreground, there are several
 bright yellow and orange flowers. To the right, a fern with feathery fronds is visible, along with a small red flower.

Mexican Love of Flowers

NOT so long ago I climbed to the top of the great pyramid shown in the lower corner of the opposite plate and looked out across that great mountain-rimmed plain on which are strewn the relics of what certainly was a most remarkable civilization.

Standing there, one could but wonder what the appearance of those temples and palaces really was when peopled by their proud builders. Did they stand there resplendent, but bare, beneath a burnished sun? Probably not. Historians seeking to reconstruct the past so often are prone to interpret life in terms of material things, and it is not at all certain that must have been the everyday items of living. It is no accident that, today, one finds the average Mexican *patio* filled with potted plants or cluttered with hanging baskets involving startling assemblages of ferns, trailing vines, or succulents. And it is a mean but ordered which does not have some sort of cherished decorative plant, even if grown in nothing more than an old tin can.

This love of plants is so widespread and goes so deeply into the lives of the Mexican people that it is almost the characteristic of the antique past. I have watched Mexican gardeners tending their plants. There was no fumbling as if it were something new to them; theirs was a deftness such as is not to be acquired in one man's lifetime—theirs was an unending of plants stemming from centuries of accumulated garden lore passed from father to son in a long chain of generations. We know that the ancient Mexicans had extensive gardens, even before the coming of the Conquistadores, for Cortés encountered veritable botanical gardens and stood in awe before their floral splendors.

And so I should like to think that those old Aztec warriors, cruel as they must have been, had the wide avenues of their cities lined with trees and that their temple and palace grounds were planted to pleasant shrubs and flowering herbs. It must have been so; otherwise the love of green growing things would not have persisted so strongly in their descendants. (Time now are the crested warriors, gone are the pompous ceremonies of the ancient priests and kings, gone are their terraced gardens—all turned to dust and rubble.)

Out of this ancient way of life the only thing that really lasted was the love of beauty and of flowers, cherished through all the latter years in the hearts of the Mexican people. There surely must be a moral somewhere here, but I am not philosopher enough to point it out and so can only light my pipe and go about my business.

DAHLIA: Unlike so many plants, the first Dahlia introduced into European gardens was not of the wild or "single" type, one example of which is shown in the opposite picture. Already the old Aztec gardeners had so hybridized and selected the garden Dahlia for unusual forms that, even today, we are undecided which of the various wild species were its ancestors. More recently, hybridists have made available a wide variety of forms, and it can be truly said that the Dahlia is King of our late summer gardens.

Grown in large quantity, the winter storage of the tubers is sometimes a problem if one is not properly equipped. However, most gardeners have learned that certain types of Dahlia can be grown from seed each year. Seed sown in a sunny window in late February or in March will produce plants for setting out at the usual time; if "pinched back" several times to make them branch, these will grow into quite shabby bushes by midsummer and produce a wealth of bloom. The flowers probably will not be of the massive "double decorative" type but will abound in interesting shades and forms, usually being of the "single" or "semiwild" type.

Dahlia seed is now being offered by commercial seedmen. Should some individual seedling plant prove particularly interesting, its tubers can be lifted and stored in the usual manner, to be planted out the next year. The genus *Dahlia* was named in honor of Andreas Dahl, a Swedish botanist and pupil of the great Linnaeus.

Decorative as they are, Dahlias first were used by the ancient Mexicans as a source of food. The tubers contain a healthful starch-like substance called inulin.

TIGER-FLOWER (*Tigridia Pavonia*): Gaudily spotted, the Tiger-Flower must have been common in Aztec gardens, for it was sacred to the jaguar ("Tigre") cult. The lower of the two examples shown is nearest the wild type in color; garden forms now also come in varying shades and patterns of blue, yellow, and even white.

It is a mystery to me why this unusual and striking member of the Iris family is not more often seen in gardens, for it is not difficult to grow. There is no reason why any gardener, even with limited space, cannot make his own hybrids and select those color forms he likes best. Grown from seed, *Tigridia* plants flower freely about the third year. The corms are lifted in the autumn and stored, in fact, *Tigridia* culture is so similar to that of the *Gnaphalium* that it should cause no trouble.



Mexico Offers flowers of the Aztecs, who worshiped at the Temple of the Sun. Right: a small yellow flower, and a red bell-shaped flower. Below: two flowers are shown at the same time. The temple appears. (Left) Two flowers, one red and one yellow, are shown at the same time.

Mexico, Happy Hunting Ground for Botanists

IN A lower corner of the opposite page our artist has shown the typical home of a Zapotecan Indian surrounded by its living cactus fence. This is not just any house. It is in the State of Oaxaca in southern Mexico in the little village of Mitla. It was from Mitla some years ago that Guopar, my Zapotecan friend and companion, and I set out on a journey to the great mountain called Zempoaltepec; it was to Mitla and his home that we returned weeks later, our pack-mules laden with pressed museum specimens, living plants, and more. If by some curious chance Guopar should see this picture he, too, will recall the incident of the Poinsettia bush which grew beside his house. But that is a story much too long to tell here; besides, the joke concerns only Guopar and me—and a certain old fool of a cargo mule.

COSMOS: The genus *Cosmos*, with about 20 species, is entirely tropical American. The two species most frequently grown in our gardens are both Mexican. The more common of these is *Cosmos bipinnatus*, well known in its various common pink, and white forms. The other species, less common, is *Cosmos sulphureus*, which as its specific name would indicate, has yellow flowers. Today apparent hybrid garden forms exist, but the true *C. sulphureus* is easily recognized by having somewhat longer central (disc) flowers with their dark colored stamens sticking out farther than those of *C. bipinnatus*.

I have often thought it a pity that gardeners, especially those in the north, nowadays rarely see the Cosmos in its full splendor. Recently a friend of mine boasted how, at last, he had learned to "huddle" his Cosmos so that they didn't "get out of hand." I saw his plants and they were miserable, spindly things less than two feet high, with scarcely a half dozen blooms on any plant open at the same time. Being a little old-fashioned, perhaps, I would start mine earlier in the season, grow them in well enriched soil so that by late summer the plants would be wide-branched and not less than six feet tall. If "huddled" properly sometimes they can be forced to as much as ten feet. Grown thus, they will ordinarily be covered with as many as a hundred blooms at once. Cosmos, naturally, are not suited for low bedding purposes in the garden, and anybody who tries to treat them thus robs himself of the magnificent show which this group of gay and colorful plants can produce.

ZINNIA (*Zinnia elegans*): The wild material of this well-known garden plant has rather

uninteresting dull purplish blooms. In the form they were first introduced into European and American gardens, as the early pictures show. What has happened since is a living monument to the science—one is here impelled also to say the "art" of the hybridist and selector for, as Dr. L. H. Bailey, revered dean of American horticulture, has pungently remarked, they now are "of nearly every color except blue and green."

I strongly suspect that another Mexican species, *Zinnia hauserana*, through hybridization, has contributed something in the way of red and orange to the color forms of *elegans*. This latter species, usually more dwarf and with smaller blooms than *elegans*, is also offered by many seedsmen in various colors and shapes.

Like the Cosmos, Dahlia, Daisy, and various other kinds included in this series, the Zinnia belongs to the subfamily *Malvaceae*. It is one of the few members of the family which is native to the Americas and will be found that fact reflected in its name. It is a native of the wilder lands, comes there generally in two forms, a low spreading one for hedges and a taller one with more upright stems and petal-like leaves. In the former is also the member of this family the so-called Dahlia "conservation" whose flowers have the leaves later taken off the stems to make attractive flowers. The only trouble with such a mutilating sort of modification is, of course, a loss of growth. Various species of native Zinnias are shown in the accompanying picture. Sometimes in an unnamed "mixture" a plant with flowers like the one farthest to the right will appear. Such plants are "throw-backs" which approach the wild type.

POINSETTIA (*Euphorbia pulcherrima*): In our high school Latin class probably one of the first adjectives we learned was *pulcher*—meaning "beautiful" or "handsome." Later we also learned that the Romans had intensifiers which they tacked on to their adjectives. Thus it was that when the old botanist Karl Ludwig Willdenow was searching for a suitable name for his new species of *Euphorbia* about 150 years ago—and scientific botanical names are in Latin, or a Latinized form of Greek—he naturally could avoid calling it "the very beautiful *Euphorbia*," or *Euphorbia pulcherrima*.

In the discussion of another species of this genus, the Crown-of-Thorns from Madagascar (pages 38, 39) it was noted that the bright scarlet objects which make the Poinsettia of Mexico so handsome actually are not parts of the flower; instead, they are highly modified petal-like leaves, which the botanist calls bracts.



ART BY J. H. B. B. B.

PLANTS OF THE MEXICAN

Living Cactus Fence Guards a Zapotec Indian's Home in Oaxaca, Mexico

Along the top of the garden, a row of cacti runs across the top. Below them grow Zinnias of modern garden form, a wild type of yellow flower. The luminous scarlet bracts of the Poinsettia of Mexico lighten the lower right corner.

More Native Mexicans

HERE are more native Mexicans and something of the way in which they got their present common names.

FRANGIPANI (*Plumeria rubra*): In attempting some detective work on the origin of the word Frangipani as applied to our plant, I was learning that the name was that of a French pastry made from almonds, sugar, and cream. This seemed to lead nowhere, for the pastry was named for its inventor, the Marquis Frangipani, a French general. But Frangipani (or Frangipanni) is not a French name; it is basically Italian, and we also learned that it goes back to an old Roman family that first came into prominence during the Middle Ages. This might seem to be a dead end in our search if it were not for another clue.

There was an old perfume called Frangipani distilled from the flowers of a red jasmine. Then in another work we discovered that the subject of this sketch once was called "Tree Jasmine." Here is the link. Now let us try to fit the facts together.

First it should be noted that the very fragrant red jasmynes most likely to have been used in perfumes seem to be Asiatic; but is it too impossible to suppose that a fragrant red jasmine might not have been brought to Rome from Asia during the days of the Empire? On previous pages we have dealt briefly with the history of the introduction of such plants into Roman gardens. From old writings we know there was keen rivalry among the Romans for the acquisition of these exotics and so, if such a remarkable plant were being grown by a particular family, what would be more natural than for their friends to ask: "Have you seen the new plant which the Frangipanni's have blooming in their garden? Such red flowers! And so fragrant!"

Having come from distant Asia and lacking a local name, it would become "Frangipanni's plant," later to be shortened to "Frangipani." There is nothing unusual in this, for it is a common practice. Forsythia honors an English horticulturist, William Forsyth, and Wisteria (with a slight change in spelling) commemorates the name of the Wistar family of Philadelphia (page 47).

How the name Frangipani became transferred from the perfume yielding red jasmine to the sweet-scented, reddish-flowered tree of the opposite picture probably never will be known, but there are literally hundreds of such instances. Among these many name-transfers is that of the Marigold. There is only one true Marigold, the Pot Marigold of Europe (page 19); yet the yellow and orangey Mexican

flowers on the opposite page also are called "marigolds." And we must not forget that there was a time when our Frangipani also was called "Tree Jasmine." While some of this may seem to be speculation, there are so many similar cases that I have come to the conclusion that the word Frangipani traces back to quite a different plant once grown by that old Roman family and named for it.

The species shown here is native in Mexico; it occurs wild also in Central America and northern South America. It is commonly planted in tropical regions and often has escaped, especially in the West Indies. Other tropical American species of *Plumeria* with white or yellow flowers are known (again, one of them is Mexican). These also are often planted, and hybrids are grown.

FRENCH AND AFRICAN MARIGOLDS (*Tagetes*, several species): The trail of the French and African Marigolds is less circumvented with speculation than that of the Frangipani. The genus *Tagetes* is entirely American, its twenty or so species ranging from New Mexico and Arizona southward into Argentina. Those which immediately concern us are native in Mexico. From various evidences it seems most likely that these plants were grown in the old pre-Conquest gardens. Also we know that they found their way into the early Spanish-American gardens and soon were sent to Spain, from whence they were carried to monastery gardens in Africa and France. By the time these plants reached northern European gardens all knowledge of their real origin had been lost. Being yellowish orange, in England they were called Marigolds (from "Mary's Gold"); but to differentiate them from the native European Marigold (now called Pot Marigold) they became French Marigolds and African Marigolds; these names then came to us from England.

Several modern garden forms of the taller "African" Marigold (*Tagetes erecta*) with its larger flower heads and the smaller, usually reddish-suffused "French" Marigold (*T. patula*) are shown here as well as a few of the wild species of the genus, some of which also occasionally find their way into our gardens.

Once was in a Mexican store as a shipment of seed from the States was being unpacked. Two of the gaily colored packets interested me, especially when the proprietor proudly assured me they were "new to Mexico." I smiled inwardly for I had seen them wild in the hills. After centuries of travel and two Atlantic crossings, the "African" and "French" Marigolds had come home.



Mexico's Flower World: A Garden of Colors and Fragrance. The Garden of Colors and Fragrance is a beautiful garden in Mexico City, Mexico. It is a large garden with many different types of flowers, including roses, geraniums, and petunias. The garden is located in the heart of the city, and it is a popular place for people to go to see the flowers. The garden is also a great place to go to see the many different types of plants that are grown in Mexico. The garden is a beautiful and colorful place that is a must-see for anyone who loves flowers.

Western North America as a Source

NOTHING has been so abundantly mental. But ours is a comparatively new country and its present culture came ready-made. With their faces turned westward, the early settlers faced an unknown wilderness. When clearings were made for crops, all else had to go; any shoot which sprang up was a weed to be destroyed. But as the settlements grew and life became secure, flower gardens were planted.

Because of the strong cultural ties, the first flowers raised were mostly European in origin; rarely in the early American writings does one encounter mention of a native plant being grown. The plant explorers who soon followed realized the potentialities of our native species and sent them back in large quantities to Europe. Many of these have since come back to us, quite different in form and in many beautiful selected varieties. Naturally, the plants of the eastern seaboard were introduced first into European gardens, and many of them have been in common cultivation there for well over two centuries.

The plants of western North America began coming into gardens only about a century ago, and the majority of them even more recently. As a result, only occasionally do we see them in anything other than their original wild forms. Because of this they are less plastic, demanding conditions very similar to those under which they exist in nature. This makes them somewhat difficult subjects for general gardening. This is also why these plants, and especially those from the Pacific Northwest, rarely are found in southern, midwestern, or eastern gardens, whereas they are much more often grown in England where the climate is more like that of northern California, Oregon, and Washington.

Anyone who has ridden the trails between the Great Plains and the Pacific will realize how deep is our regret that as yet we are unable to class more than a few of these worthy species as "common and widespread" garden flowers. The Ritter Rants (*Lewisia*), how some of them resent being moved! Acres of Avalanche Lilies (*Erythronium montanum*) in the Cascades, sometimes pushing up through the last three inches of snow so as to bloom on schedule; only to dwindle to nothing a few years after being brought into a garden. The tufted *Eriogonums* with their bursts of yellow, orange, pink, and white flowers—hosts of them growing naturally under all sorts of difficult and seemingly impossible conditions; yet how relatively few of them do well, even with the best of care and attention. And the Mariposas or Butterfly-Tulips (*Calochortus*): except for

a few forms, they mostly spurn permanent sanctuary with humans.

These and a hundred others ought to be widespread in gardens but seemingly refuse to be fully tamed, tolerating domestication usually only under very special conditions. But let us be a little patient; many will yet be broken of their wild habits, even as some already have been. For example, most of the newer blue garden Columbines are descended from the wild *Aquilegia canadensis* of the Rocky Mountains. And there are others with equal promise. Here, however, are a few Westerners already common in our gardens.

CLARKIA (*Clarkia elegans*): This excellent annual now comes in several shades and also in fully double forms; it is native in California. The generic name commemorates William Clark, associate of Meriwether Lewis (for whom *Lewisia* was named), both explorers sent out by Thomas Jefferson to examine the country westward to the Pacific.

CALIFORNIA POPPY (*Eschscholzia californica*): Originally yellow or orangey, this popular garden plant now displays several other colors. It was named in honor of J. E. Eschscholtz, a botanist on the Russian expedition led by Kotze into the Pacific, 1823-1826.

BLANKET-FLOWER (*Gutierrezia puberula*): This gaily annual is native from the Ozarks south to the Gulf and westward across the Great Plains to Arizona. It is now established more widely. Introduced into Europe from Louisiana during early colonial days, it was named in honor of M. Gaillard, French patron of botany. When one sees this plant in profuse, spreading masses in its native haunts, the origin of its common name becomes obvious.

LUPINE (*Lupinus*, various species): Except for a relatively few kinds in Europe, Asia Minor, and Africa, the 300 species of Lupine are all native in the Western Hemisphere. Capable of making great displays, almost carpets, as shown in the background of our picture, or as the Bluebonnets do on the Texas plains, the wild species often are introduced into gardens. Also, various of them have been hybridized. Our more common perennial garden forms seem to have been derived primarily from West Coast species, whereas the more showy annuals are descended from species wild in Mexico, Central America, and Andean South America.



Many Flowers of Western United States Require to Be Tamed—These Exotic Gardeners
 have been found in the West, and the flowers are now in the hands of the
 California Botanical Garden, University of California, Berkeley, Cal.

Wild Flower, or Garden Plant?

IT IS sometimes difficult to distinguish between a wild flower and a weed. But when either is brought into a garden it ceases to be "wild" and becomes a horticultural object. To the farmer in various parts of eastern North America, the plants on the opposite page may sometimes be weeds; to the field naturalist they are wild flowers; and to the patcher they are cherished subjects in the perennial border. This last is especially true when, in the skilled hands of the hybridist and selector, they yield a series of striking and unusual garden forms.

OSWEGO TEA (*Monarda didyma*): On page 25 we touched briefly on the ancient civilizations which rose up around the Mediterranean. During the long period of the development of their various cultures these peoples had experimented with the native plants and discovered those which were most useful. Among the spicy condiments and medicinal herbs of the Mediterranean and closely adjacent regions which they found were such things as Rosemary, Common Sage, Clove, Lavender, Woundwort, Thyme, Pennyroyal, Horchound, Lemon Balm, Marjoram, Hyssop, and both Summer Savory and Winter Savory. Anyone who has an herb garden will immediately recognize these as members of the Mint Family. When the cultivation of useful plants seeped into Europe from the Mediterranean region these plants went along and became standard features in cottage, monastery, and castle gardens.

As soon as possible after the settlements were established on this side of the Atlantic the colonists brought these same plants to America. But always in this new country there were pioneers, pushing on ahead of established gardens, who were forced to seek for native substitutes. America did not fail them.

Among the many useful plants they found—most of them already in use by the Indians—were two of this same Mint family, Oswego Tea (*Monarda didyma*), and Wild Bergamot (*Monarda fistulosa*). As the country was settled, both of these became fixtures in early American herb gardens along with their imported relatives. Later, when herb gardens went out of style (they are again becoming popular), these two moved over into the flower garden. This is particularly true of the originally reddish-scarlet Oswego Tea, shown opposite. For a time the similar but less striking, pale purplish-flowered Wild Bergamot almost went into eclipse, but is again making a strong comeback as an ornamental in perennial borders. Both of these now have variously colored garden forms.

SUMMER PERENNIAL PHLOX (*Phlox paniculata*): Although natural variations do occur in the wild, the great majority of the plants of this species growing naturally have pinkish-purple flowers. From these, salmon, rose, magenta, purple, scarlet, buff, and white garden forms have been developed. Ten or a dozen other native North American species of this genus have been introduced into gardens. Among the more popular of these today is the highly variable, spring-flowering Moss-Link (*Phlox subulata*), much used in rockeries. An even more variable low-growing, annual species from Texas, *Phlox Drummondii*, is also often grown. European and American hybridists have produced many forms in this group.

MICHAELMAS DAISIES (*Aster*, various species): Named for St. Michael, whose festival—Michael's Mass—is celebrated in September 29, when certain forms are at the height of their blooming period, this splendid group of perennials now has great favor with gardeners. Admitting that they put on a great show in the autumn, I still suspect that part of their popularity lies in their name and in the common supposition that they come from some foreign land. Actually, they are as American as pumpkin pie or corn-on-the-cob.

The early plant explorers who came to America about two centuries or more ago seized upon these plants and took them back to Europe, where they became a garden sensation.

When the art of hybridizing became well known, these plants were used, and many new and intermediate forms were developed. Yet all the while in America farmers were mowing them down to clear their fence rows and pastures. Worse yet, for the most part, American gardeners of that period ignored them as being no more than roadside weeds. Those few gardeners who cultivated our native Asters through the years finally were vindicated when the plants became popular. But that was only after they had come back home under the name of Michaelmas Daisies.

It is useless here to attempt a listing of the species which have gone into the make-up of our present garden forms of this group. One which stands out markedly is the New England Aster (*Aster novae-angliae*) with its large flower heads, 2 to 3 inches in diameter. It has split into blue, pink, reddish, and white forms. Plants with intermediate-sized heads and forms with small, often white flower heads indicate a blending with other species. Brought together by hybridization, they have produced a distinguished group of excellent garden plants.



Europeans did not appreciate American "weeds" until Europe made them fashionable. Some of the most popular American flowers, such as the aster, were introduced to Europe by American missionaries and traders. The aster was first introduced to Europe by a missionary in the 18th century.



Descendants of Two Outstanding Native Americans Brought on a Southern Estate

Only and the most famous of the Phoenician. It is the only one of its kind in the world and is the only one of its kind in the world. It is the only one of its kind in the world and is the only one of its kind in the world.

Genus from the Southeastern United States

RHEATH FAMILY (Ericaceae). In our eastern States, two species are so outstanding that they deserve to be treated apart from all the rest. Both of these, the Catawba Rhododendron and Flame Azalea, belong to the same group of plants, the Ericaceae or Heath Family. Although our own eastern American species of azalea and rhododendron are quite different in general appearance, the involved and botanically complex situation in the species of our western States and in Asia makes it seem wise to classify them in the same genus.

The Heath Family is world-wide in distribution and contains such plants as heather, manzanita, mountain laurel, and trailing arbutus. In stature the 1,500 or more species of this family vary from large forest trees to plants so small that, when not in flower, they might easily be mistaken for dwarfish, trailing masses. Yet widespread and varied as they are, there is one thing which the species of this family of plants seem unable to tolerate

and that is an alkaline or limy soil. Apparently this is because fungus thread—actually the plant body of various of our forest mushrooms—are associated with the roots of the members of this group, and without the help of these lively organisms the plants cannot live. For some reason the fungus thrives only in acid soils, and that is why those who, perhaps unfortunately, live in alkaline or calcareous regions can grow members of this family of plants only after extensive treatment and preparation of the soil and at considerable expense.

For nearly a quarter-century the writer of these notes has been hunting in various parts of the Western Hemisphere especially for members of the Heath family. And many a wondrous floral display he has seen beside the trail. Yet the two species shown here, growing naturally in our southern Appalachians, stand out so remarkably from all the others that nothing has yet approached them in sheer magnificence.

CATAWBA RHODODENDRON (*Rhododendron catawbiense*): One day on a rocky trail on the divide near the headwaters of the Catawba I came to a ledge where one could stand and view the magnificent rolling crest of the Blue Ridge. There before me, stretching ahead for a distance of nearly two miles and cascading down that slope for a vertical distance of more than five hundred feet, was a nearly pure stand of this rhododendron in full bloom. I shall not attempt to describe the scene.

With both climate and soil favorable, the British can cultivate not only our species of this genus but the host of Asiatic species as well. Because of this, British gardeners really know their rhododendrons; therefore, lest we seem to be partial and overenthusiastic about this plant, let us quote from the writings of that great English authority, W. J. Bean. In his *Trees and Shrubs Hardy in the British Isles*, he tells us that the Catawba Rhododendron "has proved perhaps the most valuable evergreen shrub for ornament ever introduced." I wonder what the usually cautious Mr. Bean would have added to his text could he have seen the display of this species in the spruce-topped natural gardens at the headwaters of the Catawba, on Grandfather Mountain, on Roan Mountain, or in the Great Smokies.

While some of the unusual color forms are derived by hybridization with Asiatic species the hardiness and ability to produce a profusion of bloom in the best of our garden rhododendrons come from this parent.

FLAME AZALEA (*Rhododendron calendulaceum*): Having seen and studied the Flame Azalea many places in the southern Appalachians, and especially in the Cumberland where it seems to reach a peak of coloring, the writer of these notes cannot resist himself to mention it in a detached or prosaic manner. In his book, *Ornamental American Shrubs*, Van Dersal rates the Flame Azalea as the finest shrub in the United States "because of the brilliant intensity of its flower color and its gorgeous display in bloom." Excellent, my friend! But let us take a broader view and compare this species with all other azaleas in the world. Lest either of us be accused of playing favorites we will turn again to the experienced Mr. Bean: his judgment will be unprejudiced. Of the Flame Azalea he pitifully remarks: "This is the most brilliantly colored of all wild azaleas."

In the hands of the hybridist and selector—and blended with species from other lands—both the Flame Azalea and the Catawba Rhododendron have given rise to a host of glorious color forms now found in many gardens. Grown as single specimens beside a cottage door, in serried ranks on some great estate or in massed profusion in a public park, these lineal descendants of the Catawba Rhododendron and the Flame Azalea can well afford to hold their heads proudly erect, for they are among the choicest of the blooms in that great parade of flowering plants which brings the whole world into our gardens.

Drums to Dynamos on the Mohawk

By FREDERICK G. VOSBURGH

With Illustrations from Photographs by R. Anthony Stewart

HIGH on a hill north of Rome, New York, a honey-haired little farm girl filled her arms with bright "blue flag"—wild iris.

Her bare feet splashed through the Mohawk River, for here that momentous stream is born in a sky-colored patch of iris swale in the pasture below the family farmhouse (Plate IV).

"Water off my farm goes north and south," said Donna Carpenter, Barbara's soft-spoken young father. "Rain falling on the roof of the barn drains in opposite directions."

Topographic maps bear him out. Raindrops striking one side of the ridgepole go north through the Black River to Lake Ontario and the St. Lawrence. Drops falling on the other side hug the Mohawk, which flows down to the Hudson through the green heart of New York State (map pages 76-77).

River Here a Punny Brook

A tiny stream trickling through an old stone fence, the infant Mohawk leaves the pasture in a "sudden suby," like Tennyson's brook.

"So this is your Mohawk," scoffed Photographer Tony. "Why, back home in Virginia we wouldn't even call this a run."

"Wait a while, 'Senator Clayborn,'" I advised. "It gets a little bigger."

Though widely traveled, Tony was seeing my native valley for the first time. This Mohawk country, of course, would invite comparison with other areas he had seen—England and Scotland, Egypt, Italy, Greece, as well as his native Old Dominion.

I thought I knew what his opinion would be by the time we had seen it all. Or was this confidence, I wondered, just a result of my own elation at being home again after three years overseas?

"Let's see you jump the Mohawk River, Champ," suggested Tony, sitting down forty pounds of cameras and preparing for action.

"Sure," said the lanky 15-year-old whom Tony called "Champ" because of his way of doing everything with all his might. Already nearly two yards tall, he was sunned to the color of old leather (opposite).

"But first," amended Tony. "Before we get out of the way. If we're going to take a picture of the Mohawk River, we want a little water to show."

We all had our turn at jumping the Mohawk. Then we followed its meandering

way down the hill to learn the river's story.

Stamped indelibly on river and valley is the name of the warlike Indian nation known to enemy tribes as Mohawk, meaning "Eaters of Living Things."

These fierce and formidable fighting men long stood as Guardians of the Eastern Gate of the great Iroquois Confederacy.* But a white tide lapped at the Gate and undermined its foundations.

Bloody Past and Bony Present

Up the river came stately, pipe-puffing Dutch in quest of furs and farms. Down from Canada padded and plodded intrepid black-robed Jesuit priests intent on saving savage souls and giving a new God to the Iroquois. The first of the "Black Robes" died martyrs' deaths under torture and tomahawk.

Massacre smeared the Mohawk in the long struggle between British and French which determined whether the continent should be Gallic or Anglo-Saxon. Far worse was the fighting of the Revolution, when neighbor killed neighbor and Indians scalped even children as reprisal followed reprisal.

The Revolution struck the hand of the Iroquois from New York's great gateway to the West, and in endless procession, by canoe, bateau, cart, covered wagon, pioneer families poured into the Hudson and Mohawk Valleys, the only direct water-level route through the 1,300-mile Appalachian Mountain chain.

Vision, and the brow of hard-fighting, hard-drinking "canawlers," dug the Erie Canal.

The old Iroquois trail and King's Highway, hugging the river, gave way to rail and ribbons of road. Factories rose to smudge the Valley sky and scatter gloves and guns, typewriters and teakettles, milking machines, rugs, cotton shirts, locomotives, and giant dynamos over the land and beyond the seas.

Arrowheads and Atom Smasher

Up from the steerage and Ellis Island came thousands of Italians, Slovaks, Poles to work in the mills and mingle their genes with those of the English, Scots, and Irish, the Dutch and the Palatine Germans. The Valley had come of age in the American way, complete.

* See in the NATIONAL GEOGRAPHIC MAGAZINE, Vol. 10, "First Settlers, the Indians," by Matthew W. Stirling, November, 1907, p. 1. New York—An Empire Without a Rivalry," by William Joseph Starna, 1907, November, 1907.



Under Profile Rock's Stony Stare Flows All Canal Traffic at Little Falls

THE CANAL BOATERS, WHOSE HOMES ARE IN THE CITY OF NEW YORK, ARE THE ONLY BOATERS IN THE WORLD WHOSE HOMES ARE IN THE CITY OF NEW YORK. THE CANAL BOATERS, WHOSE HOMES ARE IN THE CITY OF NEW YORK, ARE THE ONLY BOATERS IN THE WORLD WHOSE HOMES ARE IN THE CITY OF NEW YORK.



"The Ears of the Deaf Shall Be Unstopped . . . and the Tongue of the Deaf Shall Sing"

It was a first for me, standing before a group of children in the first New York School for the Deaf at West Point. The children were all with physical handicaps, but each with a strong sense of dignity and individuality. To help me out, the school principal had arranged

for the restaurant's cook, it seemed to me, to prepare coffee. The red brick walls, windows, and around Rome are more cultivated by Italian families whose hard work is rewarded by lush crops of corn, lettuce, and various other vegetables. Just over the river, the Italian community prospered and prospered, and the town of West Point is a beautiful sight to see.

My first experience in another town, I remember was in 1950, when I was with whom I had just met, a young man from downtown New York Street. I had his address, which I had just seen, and there were several people arrived in the town from New England.

"See these wide streets," he said. "Dorrick Lynch laid 'em out. Town used to be known as Lynxville."

He spoke as if he was a resident, and, indeed, Lynch was a contemporary of Washington, who called him "the American Lincoln."

But history is hard to grasp. When I was young, we lived on a hill.

I remember the first time I saw the New York New Garden and the children at Rome used to use a hill to show their parents what a hill looked like.

"This is an old lake bed," I remember him. "If you go down the Valley you'll see plenty of hills."

At the Army Air Depot, we had an AF 11 covered in paint for hours, and a big of a first time. Later, when in view of the Valley, we talked ourselves into a plan. I was sitting on the floor, he said, with his legs sticking out the door and a rope around his waist, and in case of a fire, he would be able to get out. His long, slender legs were a good example of a man's strength, and he was a good person.

Where I Vanished, Nature Reared

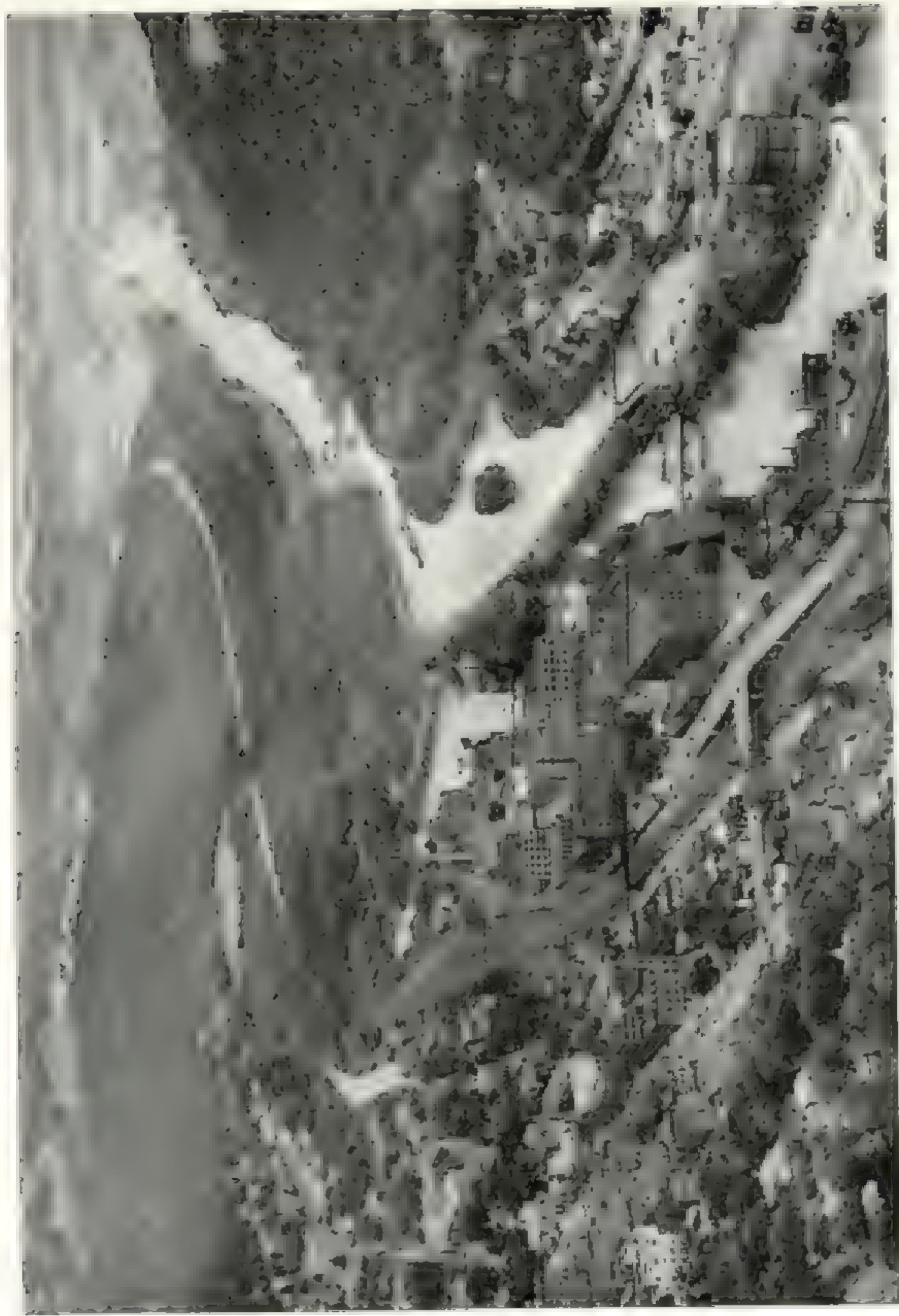
Rome, it was the same, the same, with its own set of hills, and the hills were a good example of a man's strength, and he was a good person. I had followed it, and I was up to it.



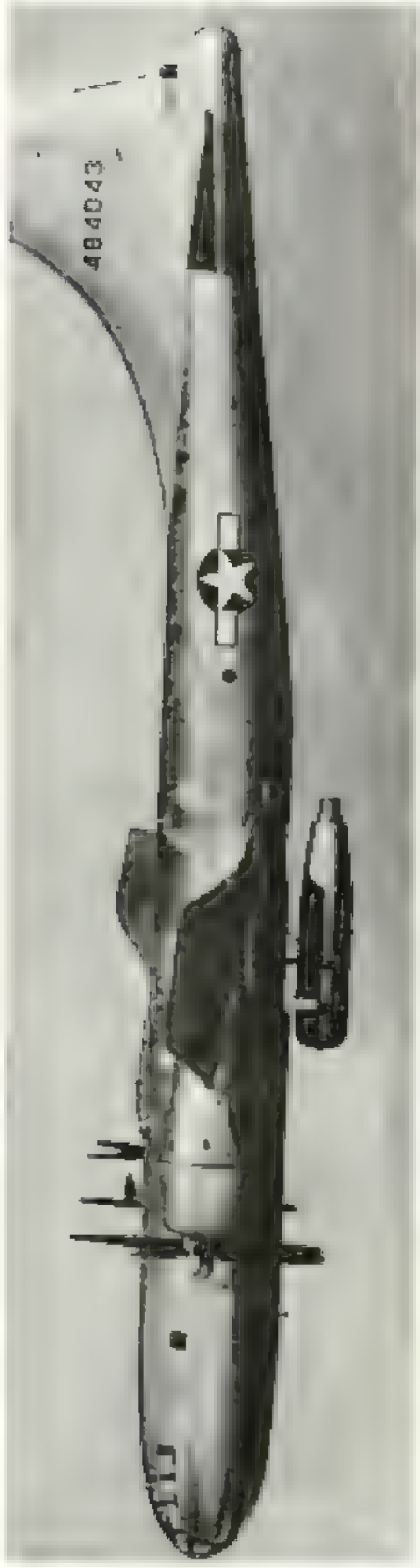
Trees at Left Line the Banks of the Mubawa River, Which Feeds the Hage Canal
The young trees are in the middle. As it grows in size and girth, some will rise to one



Like a Big Water Beetle, a Surge and Tug Plow Along the Liquid Road to Remove
Wet and Loose Material from a Road. Photo by the U.S. Army, Corps of Engineers, at
the U.S. Army Engineer Research and Development Center, Vicksburg, Miss.



Little Falls, New Jersey, a former Wharfe & P. & N. Co. property. In the foreground, the Wharfe & P. & N. Co. property. In the background, the Wharfe & P. & N. Co. property.

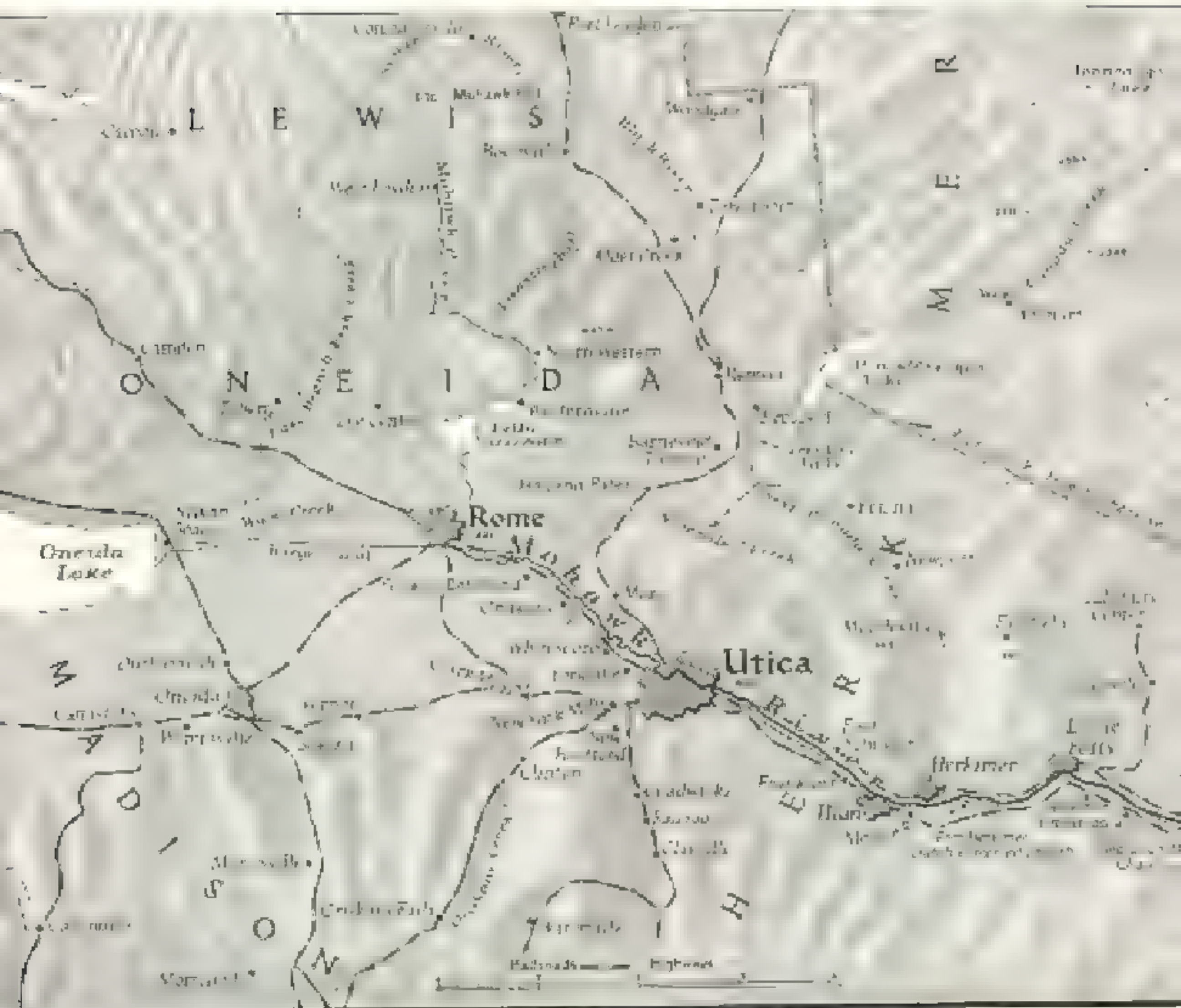


Bombardier B-24 Liberator Bomber, New York State Highway, in flight at Belmont.

See also the following pages for other views of the B-24 Liberator Bomber.



View of the New York State Barge Canal between Union and Rome.



"Look at that!" Tony shouted as we passed Utica, the Valley metropolis.

Ahead he had seen the mighty trench through which the prehistoric Mohawk drained a chain of great interior lakes. At what is now Little Falls the big waters of Lake Iroquois, predecessor of Lake Ontario, plunged over a mountain barrier in a volume at least as great as that of Niagara. Through the deep resulting gorge now tumbles the shrunken modern Mohawk while the highest bit back on the Barge Canal carries boats up and down (page 74 and Plate XIV).

Twenty-five miles downstream we saw where the river had cut straight through another Adirondack spur, its whimsical waters carving the bluffs called Big Nose and Little Nose.

From high in the air we could see the flow of automobiles, trains, and barges, all follow-

ing this great east-west crease created by running water.

At Schenectady the 250 big buildings of the General Electric Company's plant sprawl like a city within a city. Here the river spreads and meanders over the bed of another old lake, then winds east to the Hudson.

There we saw the Mohawk end in a mammoth anticlimax—a waterless waterfall. Except in winter, all but a tiny trickle is diverted to the Barge Canal, and the thundering torrent of Cohoes Falls—which moved the Irish and Thomas Moore to poetry—is only a mass of brownish rock as dry as a thirsty throat.

For a closer acquaintance with the river and canal, we found a boat, the *Wanderer*, a 25-footer used for fishing on Oneida Lake.

The skipper was the type with whom it would have been a delight to sail around the

work. (page 69). Crowned with sparse gray hair and tanned to the top of his wise head, he had twinkling china-blue eyes and a laugh which lighted up his face like a running light.

As we stopped at a canal-side gasoline station where a girl pumped fuel and water aboard, the captain chuckled reminiscently.

"One time," he said, "a fellow stopped for gas and drinking water and got the hoses mixed up. I filled his gasoline tank with water and his water tank with gasoline. He sure had to be careful not to do any smoking when he cleaned out his bilge."

From Oneida Lake we chugged toward Rome through the broad canal that has replaced the old canoe route up Wood Creek.

Our first lock delighted the Champ, who had come along to help handle the boat. As water loaded up around us to fill the lock, he claimed, "Gee, if you were going down, the water would be pouring out the same way.

Think what would happen if you fell overboard."

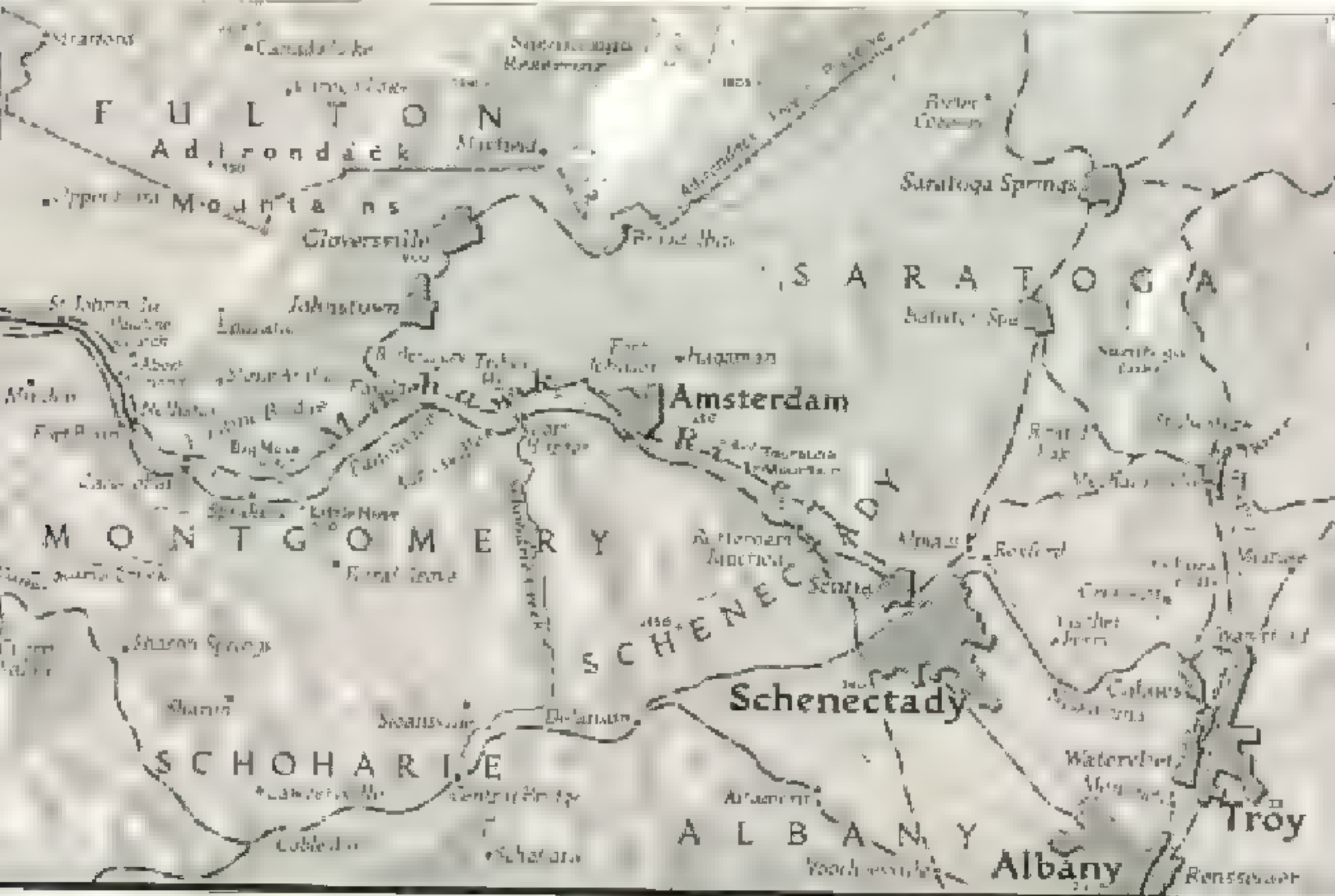
"Yep, you'd go right on it, just like a fish," said the captain cheerfully.

Except for drinking cows, a few swimming boys, and an occasional stupa-like fisherman, we had this liquid superhighway largely to ourselves. Only rarely did we see a lone

"No," said a lock keeper, "there aren't many barges; but look at their size. That one, for instance, carries as much gasoline as a 50-car train of tank cars."

Like an iceberg, these ponderous laden-bearers hide most of their bulk under water. They are generally loaded to a draft of 10 feet forward and 10½ feet aft, thus clearing the bottom at some points by only a foot and a half, since the statutory minimum depth of the canal is 12 feet.

Old canal men say that when you try to load a boat 11 feet on a 12-foot depth, it



Westward Through the Mohawk Valley the Course of Empire Took Its Way

Fedex the Valley is home to half a million people, and millions of other Americans know it as the rail highway route between the Hudson and the West. Through here each day roll 300 freight and passenger trains. New York Central's Water Level Route. Along the river will run the new Mohawk Thruway, part of the vast system of express highways which New York State began building last summer. In what it calls its greatest engineering project since construction of the Erie Canal predecessor of the Barge Canal.

roads. Except for the highway, which has been paved, the roads are dirt roads. The roads are in poor shape, and the roads are in poor shape. The roads are in poor shape, and the roads are in poor shape.

Through the town, the roads are in poor shape. The roads are in poor shape, and the roads are in poor shape. The roads are in poor shape, and the roads are in poor shape.

Utica's Name Plucked from a Hat

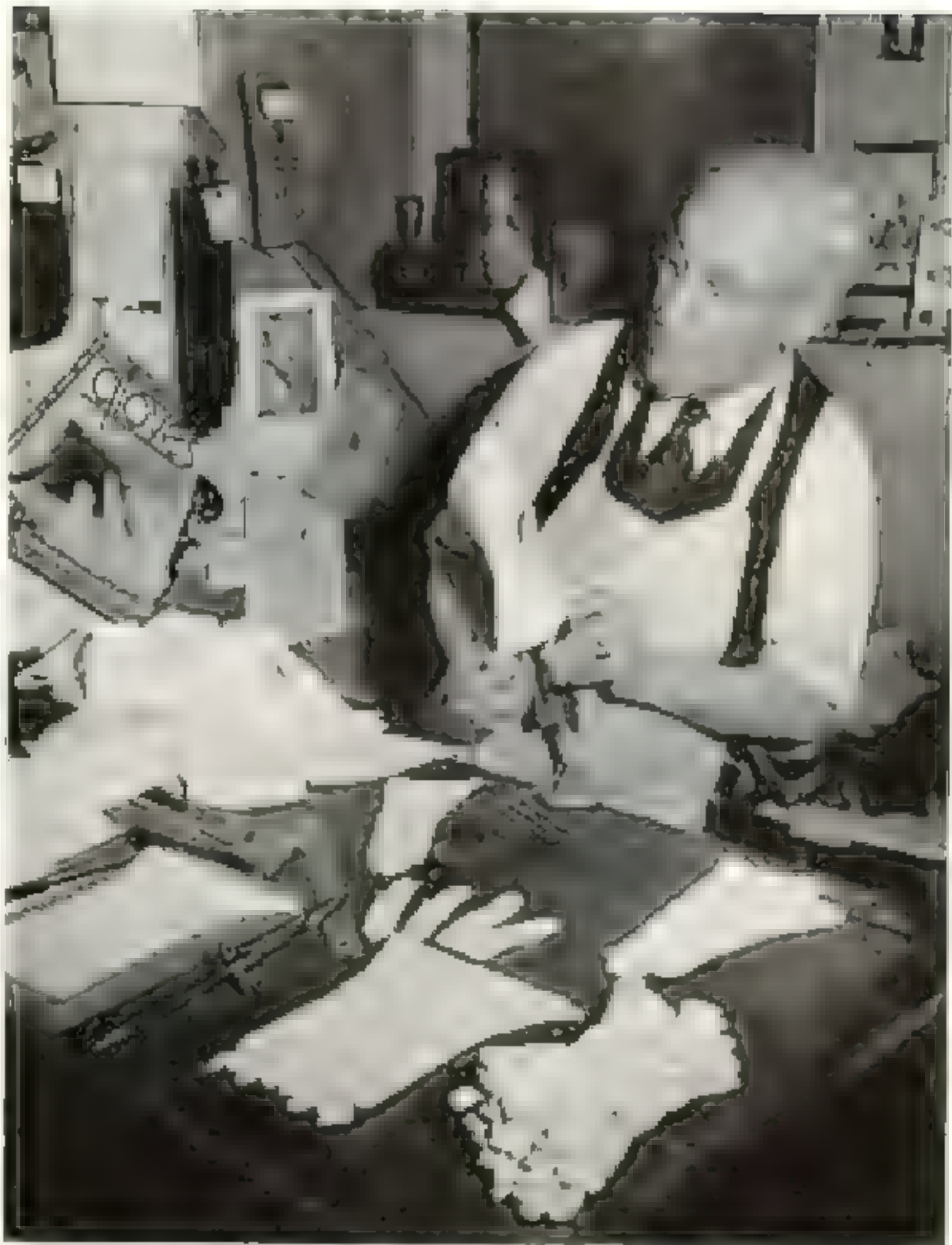
The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

Wide thoroughfares, the town of Utica, N. Y., is a town of 10,000 people.



65 Years of Experience Go into These Fine White Graves

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people. The town of Utica, N. Y., is a town of 10,000 people.

which became active in 1935 upon the death of the last surviving founder.

Now the fine old houses, with their stables transformed into School of Art studios, form a cultural center of Utica (page 68). Its art classes, exhibitions, tours, and lectures; its motion pictures and library of musical records; its summer and Saturday classes for children in handicrafts, music, dancing, speech, and art drew a total attendance last year of 50,597.

Utica has now become a seat of higher education. The Utica College of Syracuse University opened last fall with about 700 students, and the State-underwritten Mohawk College, an emergency educational setup, began operations with an enrollment of 1,200, which grew in six months to 1,831.

Mohawk College occupies a vast collection of more than 180 reconstruction-type buildings, formerly the Army's Rhoads General Hospital, on the outskirts of Utica. More than 90 percent of the students are veterans (p. 91).

The State has also established in Utica the Institute of Applied Arts and Sciences, specializing in retail management and other business training.

In Utica, incidentally, F. W. Woolworth opened his first five-and-ten-cent store in 1879. It failed!

"Where Truth and Honor Dwell"

At near-by Clinton, seat of Hamilton College, was born the statesman Elihu Root, Secretary of War and State and United States Senator. And there, as the shadow lengthened, he chose to return "to a plain old home in the Oneida Hills, overlooking the valley of the Mohawk, where truth and honor dwelt in my youth."

Hamilton, alma mater of sons so diverse as Root and Alexander Woolcott, is one of America's most distinguished small colleges. Named for Alexander Hamilton, it was founded as a school for white and Indian boys by the Reverend Samuel Kirkland, whose great influence held the Oneidas loyal to the colonists in the Revolution.

At the missionary in the college ceremony was the Oneida chief Skenandoah, who had been converted to Christianity. He was the first Indian to be baptized in the Oneida Reservation. Heaven holding on to the Domino.

West of Utica, at Oneida and Sherrill, a thriving modern industry stands as a monument to one of America's many communal utopian experiments.

To Oneida from New England 99 years ago came a colony of "Perfectionists" led by John

Humphrey Noyes, whose daring ideas included abandonment of individual, sentimental love in favor of matings directed by the community. The practice he advocated died young, but the silver-plating industry established by the energetic Perfectionists has flowered into Oneida Ltd., making Community Blue, the "silverware for brides" (Plate XIII).

North of Utica stretch the vast pine-seated Adirondacks, with their wooded slopes and myriad lakes and streams.* Instead of yielding to their appeal we kept our rendezvous with the river and rolled on down its south shore.

On the boundary between the Oneida country to the west and the lands to the east where the Mohawks held sway stands the industrial town of Frankfort, which pioneered in making matches but now has turned to milk products, road machinery, and farm tools.

Farmers Fathered Ilion's Industries

If a match is the symbol of Frankfort, a gun and a typewriter should represent Ilion. This busy town's bustling level head stems largely from the talents of the Eliphalet Remingtons, father and son, former-mechanics both, who came here from Connecticut in 1830. Young Eli made himself a rifle, and when neighbors clamored for one as good he and his father began manufacture of firearms. Later, in 1873, their descendants produced the first successful commercial typewriter.

Up in Ilion Gorge above the town stand remnants of the old Remington forge, an estate of the Remington Arms plant and the Remington-Rand factory making typewriters, office equipment, and filing systems. These plants, with a normal total of more than 6,000 workers, form the industrial heart of the Frankfort-Ilion-Mohawk community.

Almost any employee of Remington Arms, now under control of Du Pont, can tell you that Remington rifles rode west on oxcart and covered wagon, were standard equipment on many express, and teamed with ox and plow to build our Nation. Remington has made arms for every war the United States has fought since 1847 (page 91).

In near-by Mohawk, third of these triplet towns, stands the old Shoemaker Tavern, still doing business. Past the tavern planted the old Adam Helmer on a September day in 1788 as he neared the end of his 44-mile run to warn the settlers that Joseph Brant and his Indians were at his heels. His fellow scouts watching the southern hills had all been killed and scalped in the chase.

* See "New York State's Adirondack Park" (Adirondacks), by Frederick G. Voseburgh, in the *State of New York*, 1934, p. 10.

Drums to Dynamos on the Mohawk



From Swaves to Girls in Skirts in Less than 200 Years

The top of the page shows a group of Native Americans in traditional dress, including a man in a feathered headdress and a woman in a colorful dress. The bottom of the page shows a group of young women in modern, colorful dresses (white, pink, blue, red) standing in front of a building with a sign that reads "Museum of the American Indian".



"Post Two Men Behind the Tree" General Jackson during the Battle of Chickasaw

When the battle was over, the soldiers of the United States Army were ordered to bury the dead. The soldiers of the United States Army were ordered to bury the dead.



In the Middle of the Midnight at Its Source She Gathers World's

Department of Energy Operations and the American Nuclear Energy Association, New York, New York, and the American Nuclear Energy Association, Washington, D.C. 20044, and the American Nuclear Energy Association, Washington, D.C. 20044, and the American Nuclear Energy Association, Washington, D.C. 20044.



Wish Bikers Instead of Weapons Now Issue from Rome, "The Copper City"

The main body of the text is a long, horizontal, rectangular block of text that is mostly illegible due to extreme blurring. It appears to be a single line of text spanning most of the width of the page.

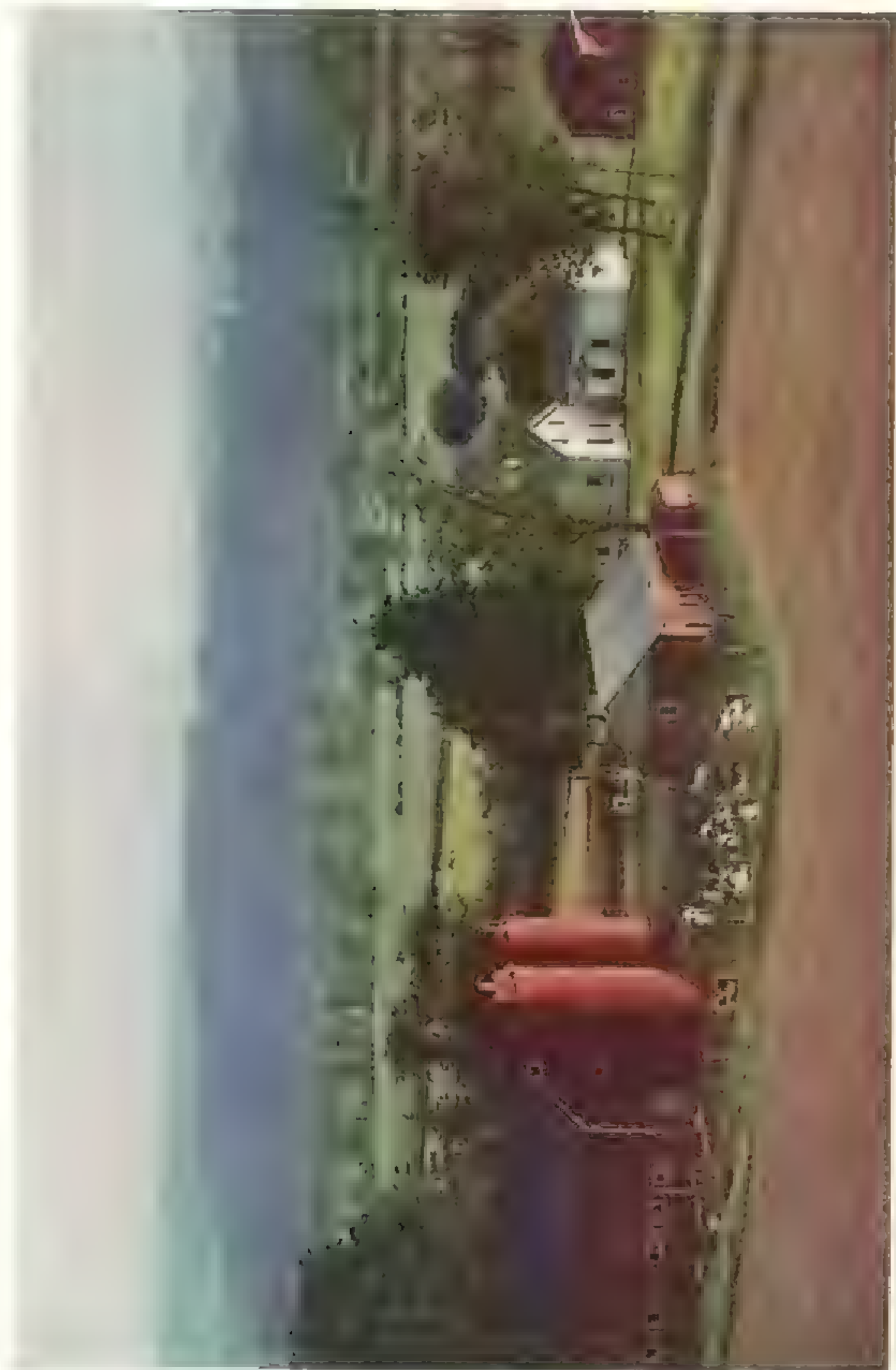


• **How Do You Lose My Table amid the Cable?**

1. $\mathcal{H} = \mathcal{H}_1 \oplus \mathcal{H}_2$ and $\mathcal{H}_1, \mathcal{H}_2$ are invariant subspaces of T .
 2. \mathcal{H}_1 and \mathcal{H}_2 are invariant subspaces of T and $T|_{\mathcal{H}_1}$ and $T|_{\mathcal{H}_2}$ are normal operators.
 3. \mathcal{H}_1 and \mathcal{H}_2 are invariant subspaces of T and $T|_{\mathcal{H}_1}$ and $T|_{\mathcal{H}_2}$ are self-adjoint operators.
 4. \mathcal{H}_1 and \mathcal{H}_2 are invariant subspaces of T and $T|_{\mathcal{H}_1}$ and $T|_{\mathcal{H}_2}$ are normal operators and $T|_{\mathcal{H}_1}$ and $T|_{\mathcal{H}_2}$ are self-adjoint operators.



From Aids to Passage to the West, showing the view of the Hudson River from the Hudson River Hotel, New York City.



Boy Scouts of America Building, formerly a Methodist Episcopal Church

Boy Scouts of America Building, formerly a Methodist Episcopal Church



Pool Called "The Swimming Hole" ("Chonchar")—"The Pool That Washes Itself"

The "Swimming Hole" is a natural pool of water, about 100 feet in diameter, and is the only one of its kind in the region. It is a very beautiful sight, and is a favorite resort of the natives. The water is very clear, and the pool is surrounded by a dense forest of tropical trees.

Thanks to Helmer, the settlers reached the forts in time. But black behind them rose the smoke of their homes as the Indians burned their homes and crops.

In Mohawk lived the man who launched the profession of "Government girl." Gen. Francis E. Spinner, appointed United States Treasurer by Lincoln in 1861, was the first to employ women in Government offices. Appropriately, his first appointee, Miss Jane Douglas, was from Dion, whence came the marriage which was to call the nimble fingers of millions of women into the offices of the land.

At Herkimer, across the river, grateful women employees of the Treasury Department erected a statue of this brave man. In the same park a vital, arresting bronze shows General Herkimer directing the Battle of Oriskany and bears his name the way he wrote it: "Herkheimer."

Stony, brawling West Canada Creek, one of the Mohawk's tributaries, pours into it at Herkimer, and here several industries have developed—office furniture, women's clothes, nutcrackers, air guns, gloves, paper, milk coolers.

Milk Rides Big "Vacuum Bottle" Trucks

From a Herkimer milk station a tank truck was taking off for New York with 3,580 gallons of milk only one or two degrees above freezing. Supplementing milk trains, these giant vacuum bottles on wheels make the 220-mile trip in eight hours. Some of the milk gets from cow to New York consumer in half a day.

Much of the milking machinery comes from Little Falls, six miles downriver, where the Mohawk pays toll in water power as it races through its narrow gorge (page 74 and Plate XIV). Other factories add bicycles, vehicles, and a host of goods to the Valley's outpouring of varied industrial goods.

Dolgeville, to the north, pioneered in felt manufacture and in the earnings-sharing system of employee benefits.

Below Little Falls, on the south side of the river, the old homestead of General Herkimer jazes out at passing trains and the mirror of the Mohawk. Beside this red-brick farmhouse, maintained by the State, rises a monument to the general, who died here ten days after Oriskany from amputation of his leg.

Near by dozes the Indian Castle Church, built as a Mohawk mission in 1769. Here Joseph Brant, future great war chief, translated the Gospel of St. Mark into Mohawk. He and Nicholas Herkimer, neighbors, were

later to be foes in the death in the dark dingle of Oriskany (Plate III).

Nine miles upriver is one of the rocks against which the red tide dashed in vain—the sturdy old limestone Dutch Reformed Church which served as a fort in the Revolution. Over the original entrance, now walled up, is carved "J. H. E. 1767," meaning "Johan Herkimer Erbaut (built)." Old Johan was the general's father.

In this vicinity centered much of the action of Walter D. Edmunds's *Demons Along the Mohawk*. Almost every well-built stone house was a fort.

Below the felt shoe and underwear manufacturing town of St. Johnsville stands the old Palatine Church, solid and sturdy as the Lutheran pioneers who built it in 1770.

Among the families that helped erect this church were the Nellises, for whom near-by Nelliston is named. When Indians shot jagging arrows at the road during the 1750 raid, one of the Loyalist Nellises, a lieutenant in Butler's Rangers, stayed their hand. Now, in normal times, members of the family from Canada, the Valley, and far afield flock here for an annual reunion.

Transriver twin of Neliston is Fort Plain, whose now-vanished fort on the south shore hills was a key to the Valley's defenses. Historic old homes stand on river-built terraces, and here Nelson Greene, Valley historian, dwells in a house so luxuriant in shrabery that his wife once said she lived "at the bottom of a green well."

Abel Island, just north of town, is named for the Dutch trader, John Abel, who fathered—by two different Indian women—both the Seneca chief Cornplanter and Handsome Lake, reformed drunkard and 19th-century prophet, whose doctrines are still religiously followed by many Indians on New York State reservations.

Gums along the Mohawk

In Canajoharie, three miles downriver from Fort Plain, we tried an experiment. The town's Indian name, meaning "the Pot that Washes Itself," comes from a pothole in Canajoharie Creek which was kept continually clean by the swirling nation of the water. How many residents, we wondered, knew the name's origin and could point out that original washing machine?

"Can you direct me to the Pot that Washes Itself?" I asked a young man I met on the street. "The what?" He looked at me as if he thought I myself might be a pot slightly cracked.

But the next half-dozen residents knew,



Gum Chewer Mechanical Chewing in Mouth, Using Chant

and the other one, the "Beech-Nut," is a small, round, hard, white, nut-like candy, which is made in New York City. The "Beech-Nut" is a very popular candy, and is often used as a gift.

It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.

The "Beech-Nut" is a very popular candy, and is often used as a gift. It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.

The "Beech-Nut" is a very popular candy, and is often used as a gift. It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.

The "Beech-Nut" is a very popular candy, and is often used as a gift. It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.

The "Beech-Nut" is a very popular candy, and is often used as a gift. It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.

The "Beech-Nut" is a very popular candy, and is often used as a gift. It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.

The "Beech-Nut" is a very popular candy, and is often used as a gift. It is made of a mixture of sugar, cream, and vanilla, and is often used as a gift.



Cars in This Picture Span a Hundred Years of Remington Arms

[illegible]

"How Do You Say 'I Love You' in Spanish?"

1. The first step in the process is to identify the problem. This involves gathering information about the situation and understanding the needs of the stakeholders involved.



"Held Fast That Which Is Good" Might Well Be the Motto of the Older Generation —
 — and the Younger, too. — In the center, a woman in a light-colored dress is seated at the head of the table, surrounded by others. The room is decorated with patterned wallpaper and framed pictures.



At Mrs. Johnson, Weird Faces Peer out of the Past

At Mrs. Johnson, weird faces peer out of the past. Mrs. Johnson (left) is seated, surrounded by others. The room is decorated with patterned wallpaper and framed pictures.

"I thought," he said, "it would be a nice place to set up a little business."

But among the visitors drawn to Johnson Hall were this Joseph Brant and Ethel Brant Monture of Rochester, New York, great-great-granddaughter of the chief (page 95).

In the solid mahogany stair rail at Johnson Hall are deep gashes which tradition says were made by Brant's tomahawk as a sign to his warriors to spare the house.

Another story relates that when prisoners were being taken toward Canada, after the Cherry Valley massacre, Brant ordered one of them, a Dutchman, to go back about two miles and get some birch bark—meaning for him to escape. To the Dutchman an order was an order, and he reappeared bearing the birch bark, much to the chief's disgust.

One of the last battles of the Revolution was fought on October 25, 1781, at Johnstown, where the well-preserved stone fortress-jail still serves as calaboose. North of town the raiders under hated Walter Butler were beaten, and he himself was later shot dead when he paused to gesture defiance at the pursuers.

Tales of atrocities perpetrated or permitted by Butler still linger in the Valley, though recent historians paint him in a better light—and as a boy I shivered at the sight of sinister old Butlersbury, south of Johnstown. Given a face lifting with new white siding by its present farmer occupant, the ancestral home of the Butlers now bears a less evil and secretive look. But it still evokes a huddler in those brought up on the writings of Robert W. Chambers, who lived at near-by Elmira.

Colonial Courthouse Still in Use

In Johnstown, seat of Fulton County, court still convenes in the colonial courthouse built by Sir William Johnson in 1722. From the bellry atop its neat red-brick symmetry, a rope-pulled hammer hitting an old metal triangle summons lawyers and litigants to court after recess as of yore (page 94).

But in front of the witness chair is a women panel built in 1929. No sleek modern feminine legs shall be suffered to distract or influence this court!

From above the judge's bench looks down the portrait of Judge Daniel Cady, father of the feminist Elizabeth Cady Stanton, most famous of Johnstown's daughters. In the judge's office, more than a century ago, she noted how tragically the laws of the time discriminated against women, and in a long, energetic life successfully fought for women's rights, including equal suffrage.

On nearby Green Street, in front of the 1763 home of the schoolmaster of Sir William Johnson's free school, now stands a glove-shop sign pointing to a factory in the rear.

Abundance of deer for buckskin led to early establishment of the leather industry at "Stump City," now Gloversville. Settlement of the site began in 1752 after purchase of a 20,000-acre tract here by one Arant Stevens and nine others for "three pieces of shewde (shoddy), six pieces of galling linen, three barrels of Beer, six gallons of Rum, and a fatt Beast."

Today progressive Gloversville is a city of 23,300—nearly two-and-a-quarter times the size of a joining Johnstown.

Source of many of the fine gloves worn in the United States, Gloversville and Johnstown today have large tanneries and hundreds of glove factories, ranging from tiny backyard handicraft shops to elaborate modern plants.

Hand in Glove with Geography

Hides come from far corners of the earth. At a typical Gloversville tannery we saw bulky bales of skins roll in from Brazil, South Africa, Nigeria, and the Anglo-Egyptian Sudan. The dusty hide worn by a half-type sheep roaming the vast South African veldt will grace slender feminine hands as chic dress gloves next Easter (Plate XII and page 79).

Other exotic hides undergo a similar transformation. The original wearer of the skin in some "pigskin" gloves may have been a Mexican peccary or the carpincho, or capybara, a largely aquatic South American rodent.

Fine kid gloves are a specialty here, though numerous other kinds are made, including fabric and baseball gloves.

Many workers and factory owners are descendants of skilled glovemakers who came from England, Scotland, or continental Europe generations ago.

For sewing, some factories now send gloves all the way to Puerto Rico and back by plane.

A hundred other products of the two cities range from baseballs to baby food.

In Johnstown 57 years ago was founded a business which has won Nation-wide renown. Charles B. Knox, son of a Mohawk Valley flour and feed merchant, had been a lumberjack, sheepherder, Texas Ranger, and traveling salesman when he learned of a new process for making gelatine and began his manufacture. He had to carry glove samples to pay his expenses while introducing the product, and the business was only a struggling infant when he died in 1935.

His widow, however, proved to be one of the outstanding businesswomen of her time,

Drums to Dynamos on the Mohawk

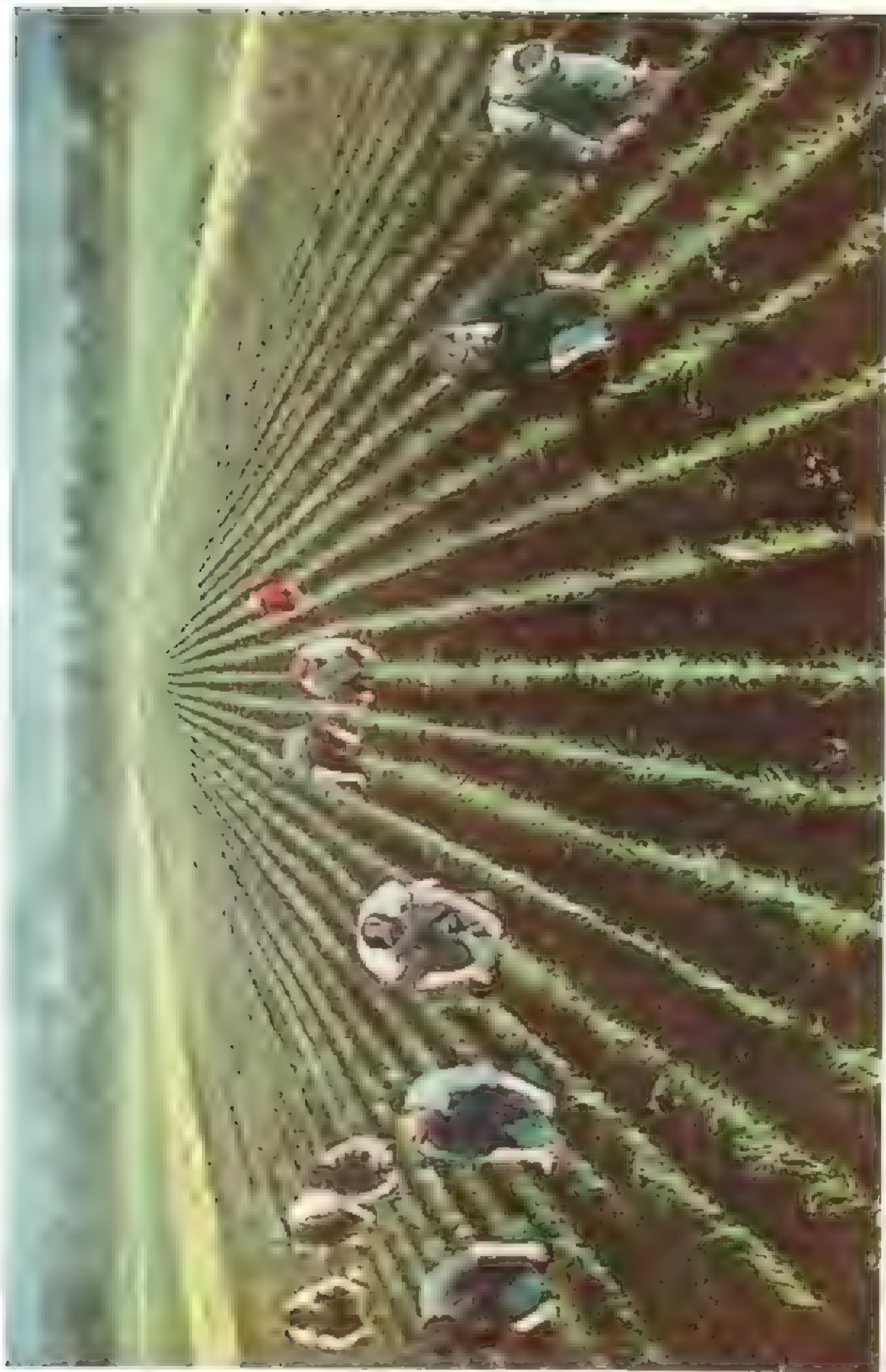


Near This Idyllic Trysting Spot, Temple of Atomic Research Rises

THE NEW YORK STATE POWER AUTHORITY HAS PLANNED A LARGE POWER PLANT TO BE BUILT AT THE MOUTH OF THE MOHAWK RIVER, NEAR THE CITY OF ALBANY. THE PLANT WILL BE A COMBINATION OF A THERMOELECTRIC AND A HYDROELECTRIC PLANT. THE THERMOELECTRIC PART WILL BE A LARGE REACTOR WHICH WILL PRODUCE ELECTRICITY BY THE USE OF ATOMIC ENERGY. THE HYDROELECTRIC PART WILL BE A TURBINE WHICH WILL BE DRIVEN BY THE WATER OF THE RIVER. THE PLANT WILL BE ONE OF THE LARGEST AND MOST MODERN IN THE COUNTRY.



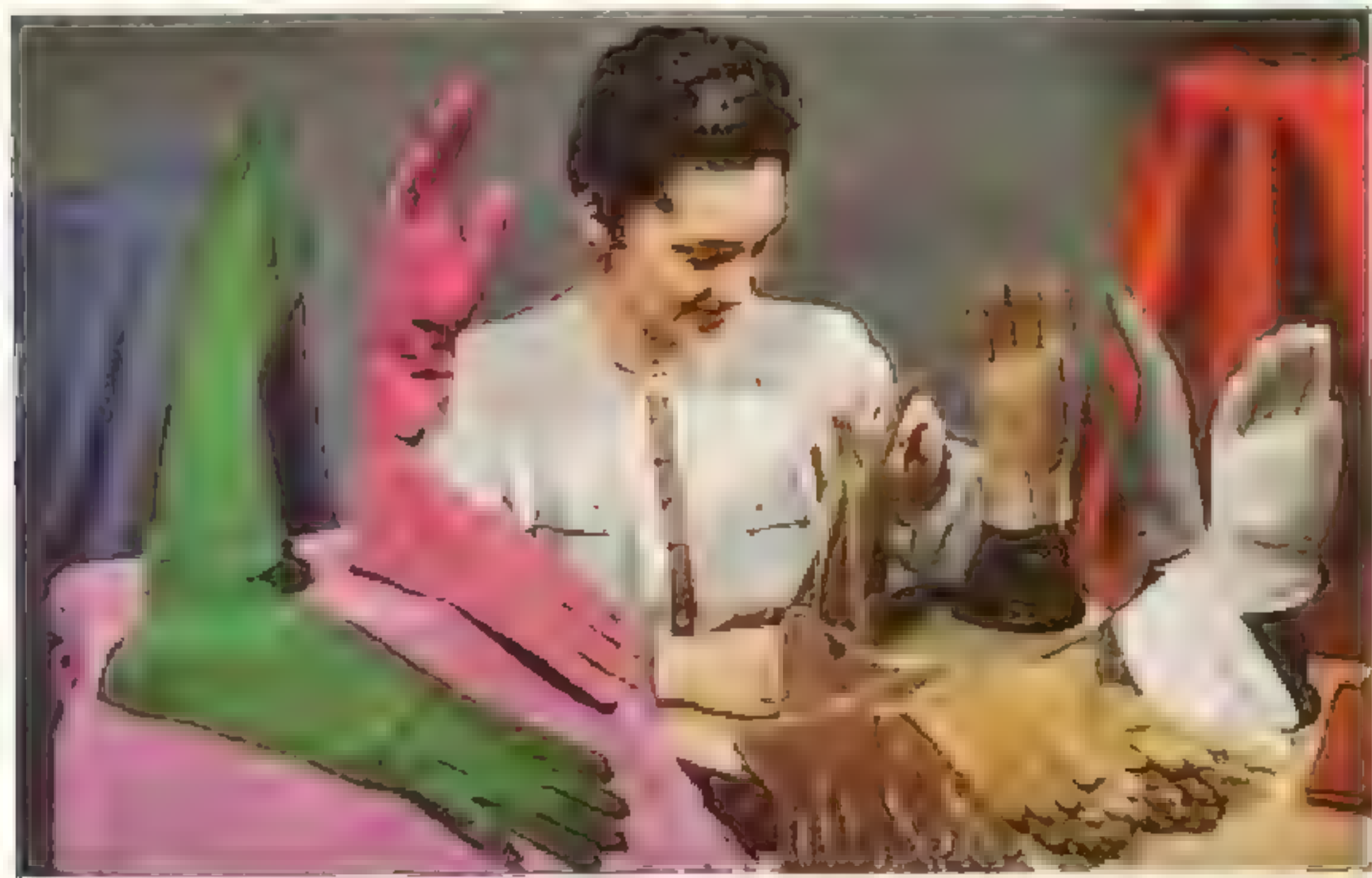
Fisherman's Wharf and Wharf in the Young and Carleton, Montreal, New South Wales, N. H. of Boston



Men Subjects Studying a Peculiar Plant. How to Weed the Field.

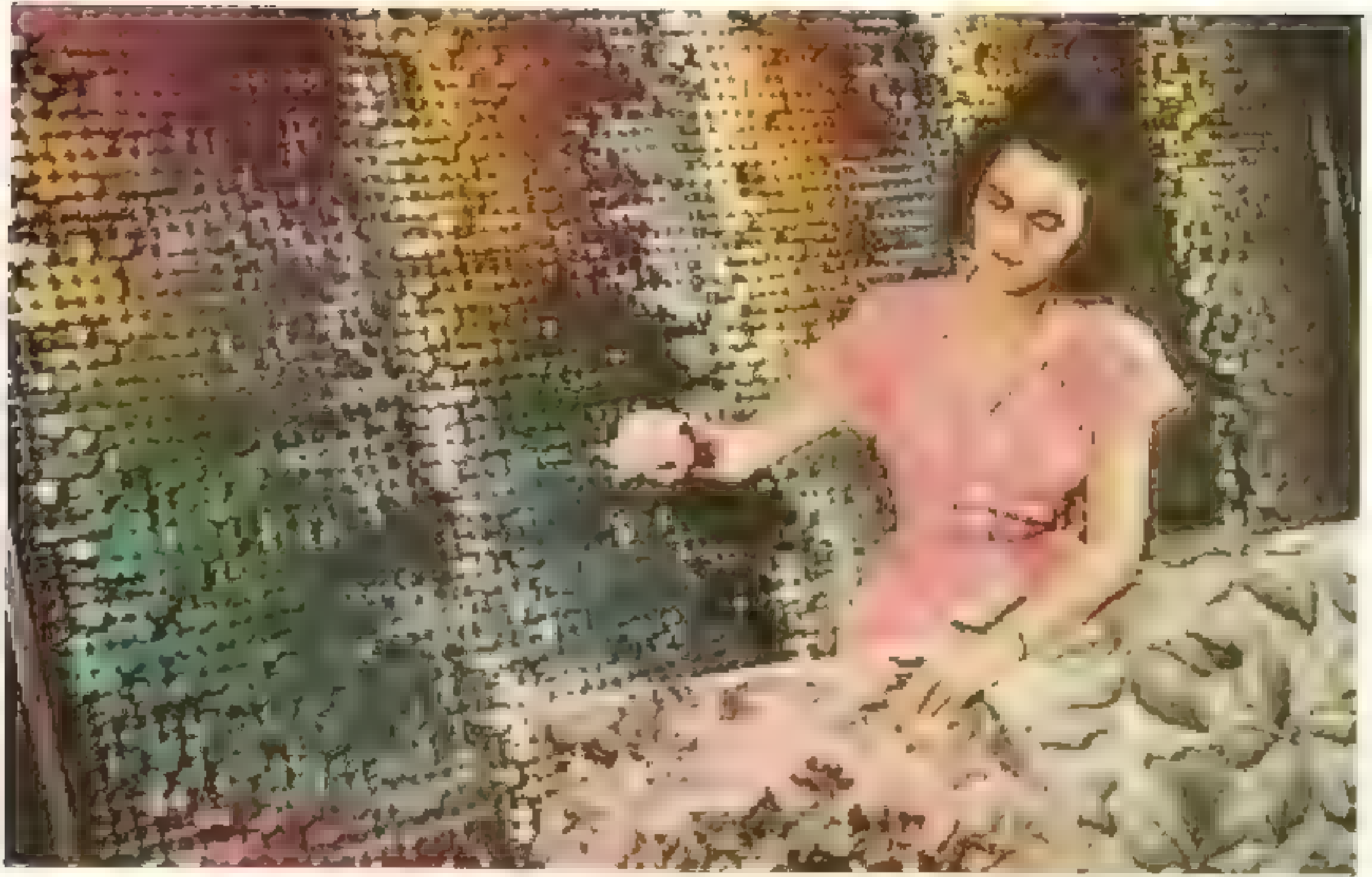


This Electric Needle Cuts Our Sweat Shirts for Athletes. Whole Teams at a Time
 Made at Lowell, Mass. — Here, the machine makes the shirt for the U. S. Olympic team. The machine is made by the U. S. Sewing Machine Co., Lowell, Mass.



With the War Over Color Is Coming Back to Lady's Gowns
 In Gowning, the woman is making a part of the dress. Here and in places like it, town millions of imported
 dresses are made. The dress is made of the same material as the dress you see in the picture.

Dances to Dancers in the Midwest



Against the Rainbow Round Her Shoulder, Sue Checks the Lines in Rows

A 2nd grade student, Sue, is shown in the photograph above, sitting on the floor and holding a small object. She is wearing a pink dress and is looking down at the object in her hands. The background is a plain, light-colored wall.



Trays of the 1st grade—Silverware in the Midwest at Omaha Community

A group of 1st grade students are shown in the photograph above, sitting around a table and holding small objects. They are wearing various colored shirts and are looking towards the camera. The background is a plain, light-colored wall.



Fig. 1. The ship's hull and superstructure, taken from the ship's deck.

The ship's hull and superstructure, taken from the ship's deck. The ship's hull is painted red and the superstructure is painted white. The ship's hull is made of steel and the superstructure is made of aluminum.



FIGURE 1. A large room, likely a study or library, with a man in a suit standing near the fireplace and a woman seated at a table. The room is filled with bookshelves and various pieces of furniture, creating a formal and scholarly atmosphere.

The photograph shows a large, ornate room, likely a study or library, with a man in a suit standing near the fireplace and a woman seated at a table. The room is filled with bookshelves and various pieces of furniture, creating a formal and scholarly atmosphere.

The photograph shows a large, ornate room, likely a study or library, with a man in a suit standing near the fireplace and a woman seated at a table. The room is filled with bookshelves and various pieces of furniture, creating a formal and scholarly atmosphere.

The photograph shows a large, ornate room, likely a study or library, with a man in a suit standing near the fireplace and a woman seated at a table. The room is filled with bookshelves and various pieces of furniture, creating a formal and scholarly atmosphere.



Picture of Peace, but on This Hill Early Missionaries Met Torture and Death

At the foot of the hill, where the missionaries were killed, a small monument marks the spot. The hill is now a park, and the lake is a beautiful sight. The scene is peaceful, but the history of the missionaries' deaths is a sad one.

and from this humble beginning she built the Knox Gelatine Company of today, with its large manufacturing plant at Camden, New Jersey, and its offices and packaging plant in Johnstown. At 89 Mrs. Knox is still a source of wise counsel to her son and grandson who now run the business. Among her many benefactions to Johnstown are a home for women, carbolic athletic field, and Y.M.C.A. swimming pool.

From bone from Argentina the firm makes gelatines for salads, desserts, baby food, soups, and confections, for photographic film, capsules, and sanitary coatings for meat and other foods. Knox products are used in treatment of peptic ulcers, and an outstanding recent addition is a blood plasma substitute developed during World War II.

Carpet City Notes Croving for Color

Neighboring Amsterdam's livelihood rests largely on rugs and carpets, first made there by John Sanford 100 years ago.

At a big carpet plant the manager told us that lack of labor was the chief bottleneck preventing full production.

Into the wool-washing department poured loads of strong coarse-filtered wool from Ireland, Iran, India, China, Australia, New Zealand, Egypt, Turkey, Arabia—all over the world except home. American wool is of such fine quality that most of it goes into clothing, not rugs.

While we watched giant looms, almost fully automatic, weave each petal in just the right place in intricate flower designs, a company official commented on fashions and trends.

"Americans," he remarked, "are becoming more color-conscious than ever. Lighter, brighter colors are in demand now. The style started on the Pacific coast and in the Southwest" (Plate XIII).

Among the other products of this industrial city of 33,300 are pearl buttons, paper, gloves, shoes, and clothing, as well as a wide range of wear, looms, and brooms. Large quantities of broomcorn were once grown in the Mohawk and Schoharie Valley.

Col. Guy Johnson, Sir William's nephew and son-in-law, lived in Guy Park Manor, close to the river, and at near-by Fort Johnson is Sir William's early home (page 95).

Both Tribes Hill and Fort Hunter, at the mouth of Schoharie Creek, were once strongholds of Mohawk clans, and at Auriesville perches the great shrine of the Valley. Here stood the Mohawk village of Ossereton, where America's first canonized martyrs—Isaac Jogues, René Goupil, and Jean de Lalande—died for their faith 300 years ago.

Through the help of the Protestant dominic Johannes Megapolensis of Fort Orange (now Albany), Father Jogues escaped after his companions had been killed by the Mohawks and he himself had suffered terrible torture. But the heroic "black Robe" returned from France to the scene of his travail and eventually his tomahawked head was spiked on the Indian post.

In the dim ravine where he walked and prayed, wood thrushes sound their flutes at dusk. "It seems," said Tony, "as if he walked here still."

Near the spruce Coliseum on the hilltop we talked with learned, congenial Jesuits who watch over the shrine with loving care.

Besides stone tomahawks and other implements, they have found skulls and skeletons of Indians and also of two Negroes.

Inadvertent assistance is given by ground-hogs, which occasionally bring up human bones, thus indicating where to dig. "But as archeologists," one Jesuit dryly observed, "they are not very scientific."

Driving on downriver toward Schenectady, we stopped at the little whitewashed Jun Marie House at Rotterdam Junction. Built about 1680, it is the oldest still standing in the Valley. A local policeman, his children, and grandchildren are tenants, but descendants of the Marie family still own it.

In the center of one of its fertile fields is an area never touched by the plow because tradition has it that Negro slaves of the Mables are buried there.

Lique and Locomotives for the World

At Schenectady the Mohawk flows into the future, for here are the vast General Electric Company works, with their laboratories pioneering new worlds of science.

Here, too, is the American Locomotive Company plant, again turning out giant diesel-electric locomotives and other engines for the railroads of the world (page 107) after building thousands of tanks and tank destroyers during the war. America's first diesel-engine was made here in 1923, and Alco's oil-burning, electric-drive mammoths are now being turned out by assembly-line methods.

Electrical power transmission equipment and a turbosupercharger come from General Electric, and another close link between the two firms is the little brick building where G-E was born. Originally the McQueen Locomotive Works, an offshoot of American Locomotive, the building was bought by Thomas A. Edison in 1886 and burgeoned into mighty General Electric, whose hundreds of buildings now surround that humble nucleus.



Where Indians Squatted in Pawnee, Children Hear the Story of Johnson Hall

For a long time the children of the Pawnee Indians have been coming to Johnson Hall, the second largest building in the world, to hear the story of the building. The children of the Pawnee Indians, who are now living in the reservation at Fort Union, N. M., are now coming to Johnson Hall to hear the story of the building. The children of the Pawnee Indians, who are now living in the reservation at Fort Union, N. M., are now coming to Johnson Hall to hear the story of the building.

When the first of the S. P. S. plant was built, the government had no other plan for production and control of energy. But let us suppose that the government had a plan for production and control of energy. But let us suppose that the government had a plan for production and control of energy. But let us suppose that the government had a plan for production and control of energy.

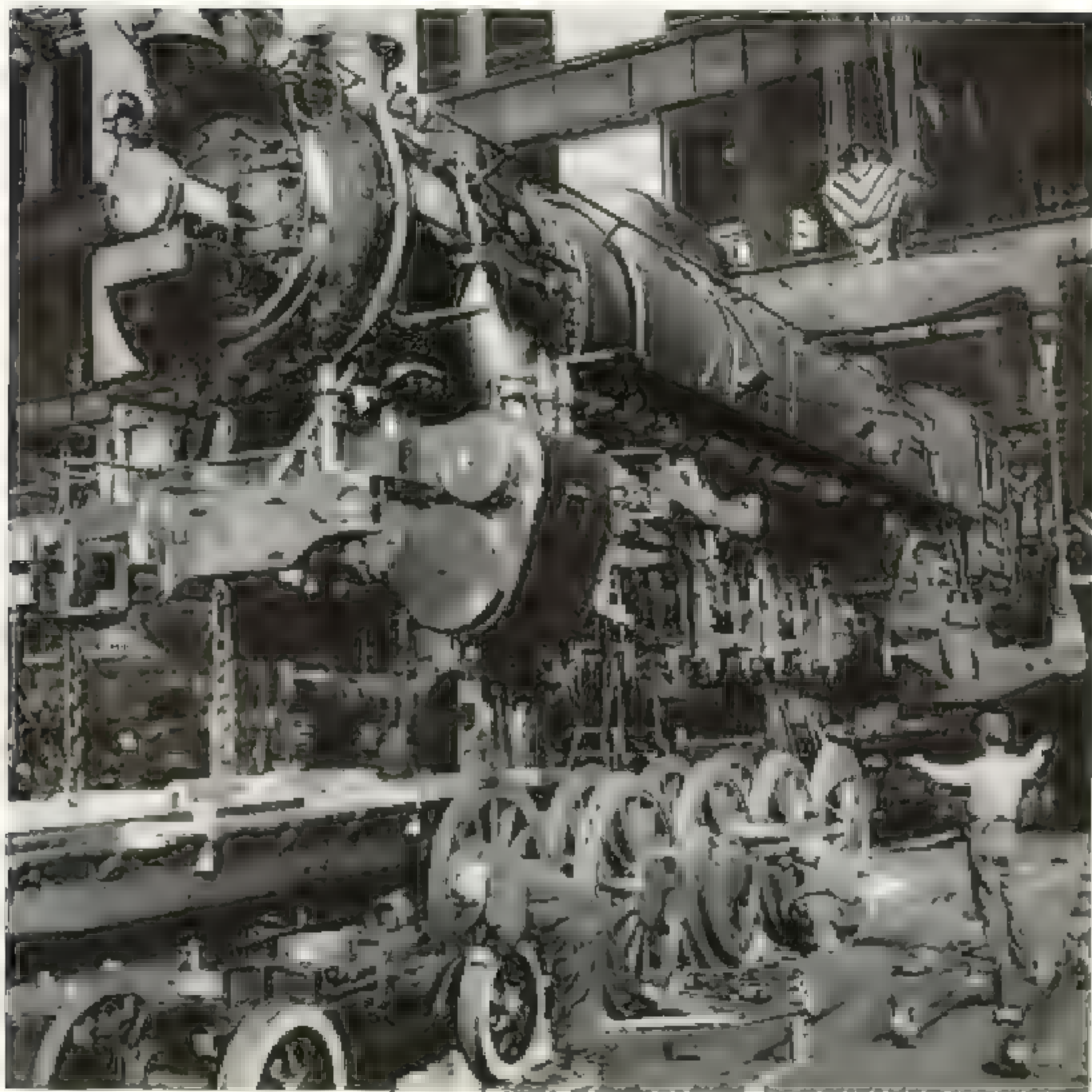
The first plan for production and control of energy was the plan for production and control of energy. The first plan for production and control of energy was the plan for production and control of energy. The first plan for production and control of energy was the plan for production and control of energy.

their Diesel Plant. Generators of this type were being produced for Paris, France, and other places in the post-war world, as well as for use at home.

Magic on the Mohawk

Present research at the G-E laboratories in cooperation with the Government in effort to "solve" the problem of the war. One scientist we met was making miniature submersibles in a home "deep freezer" in connection with studies designed to prevent the melting of ice on airplane wings upon landing.

Amazingly he succeeded in causing the



Off Goes a Locomotive to Help Haul the Loads of Vast Brazil

At the present time, in the American continent, there is no other place where the wheel is so much in vogue as in Brazil. For the last few years, the country has been suffering from a severe drought, and the people have been forced to use the wheel for the first time in many years. The wheel is now being used for the first time in many years, and the people are now using it for the first time in many years.

and several from a Liverpool ship, the cargo, which was on board, was a large quantity of iron, steel, and other goods. The cargo was being shipped to Brazil, and the ship was being loaded with the goods. The ship was being loaded with the goods, and the cargo was being shipped to Brazil.

Nothing was so common as to see a large quantity of iron, steel, and other goods being shipped to Brazil. The cargo was being shipped to Brazil, and the ship was being loaded with the goods. The ship was being loaded with the goods, and the cargo was being shipped to Brazil.

It is not only the iron, steel, and other goods that are being shipped to Brazil, but also the people. The people are being shipped to Brazil, and the cargo is being shipped to Brazil. The cargo is being shipped to Brazil, and the people are being shipped to Brazil.

As a matter of fact, the locomotive is being shipped to Brazil, and the cargo is being shipped to Brazil. The cargo is being shipped to Brazil, and the locomotive is being shipped to Brazil.

Now, it is not only the iron, steel, and other goods that are being shipped to Brazil, but also the people. The people are being shipped to Brazil, and the cargo is being shipped to Brazil. The cargo is being shipped to Brazil, and the people are being shipped to Brazil.



Waving His Scientific Wand He Produces Man-made Snow

A man in uniform, General Elmer Dowd, of the Army, is standing in a laboratory, waving his scientific wand. The wand is a long, thin, glowing object, possibly a wand or a stick, which is emitting a bright light. The background shows various pieces of laboratory equipment and a large window.

They all know the knobby, old school being recorded that are painted upon the Indian's skin. When war drums rolled across the Mohawk valley the excitement of the Valley and the frontier was aflame.

At work in the laboratory and in the carpet room, and in the school, all the men were running with the ether into the clearing of the sky and finding their souls in the sky.

And in the laboratory, the work will go on, and the number of students and their work will be more than 1000. The school will

Government, and the known as the Knobby. At the school, the work will go on, and the number of students and their work will be more than 1000. The school will

On the school, the work will go on, and the number of students and their work will be more than 1000. The school will

Tomahawk to Television

World-known as WGY, the Great Electric radio station, and the station WRGB has long been prominent in television. The station is now a part of the New York City television system, and is now a part of the New York City television system, and is now a part of the New York City television system.

After watching the work of WRGB, they are all rolled up in the end of the Mohawk.

They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk.

They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk.

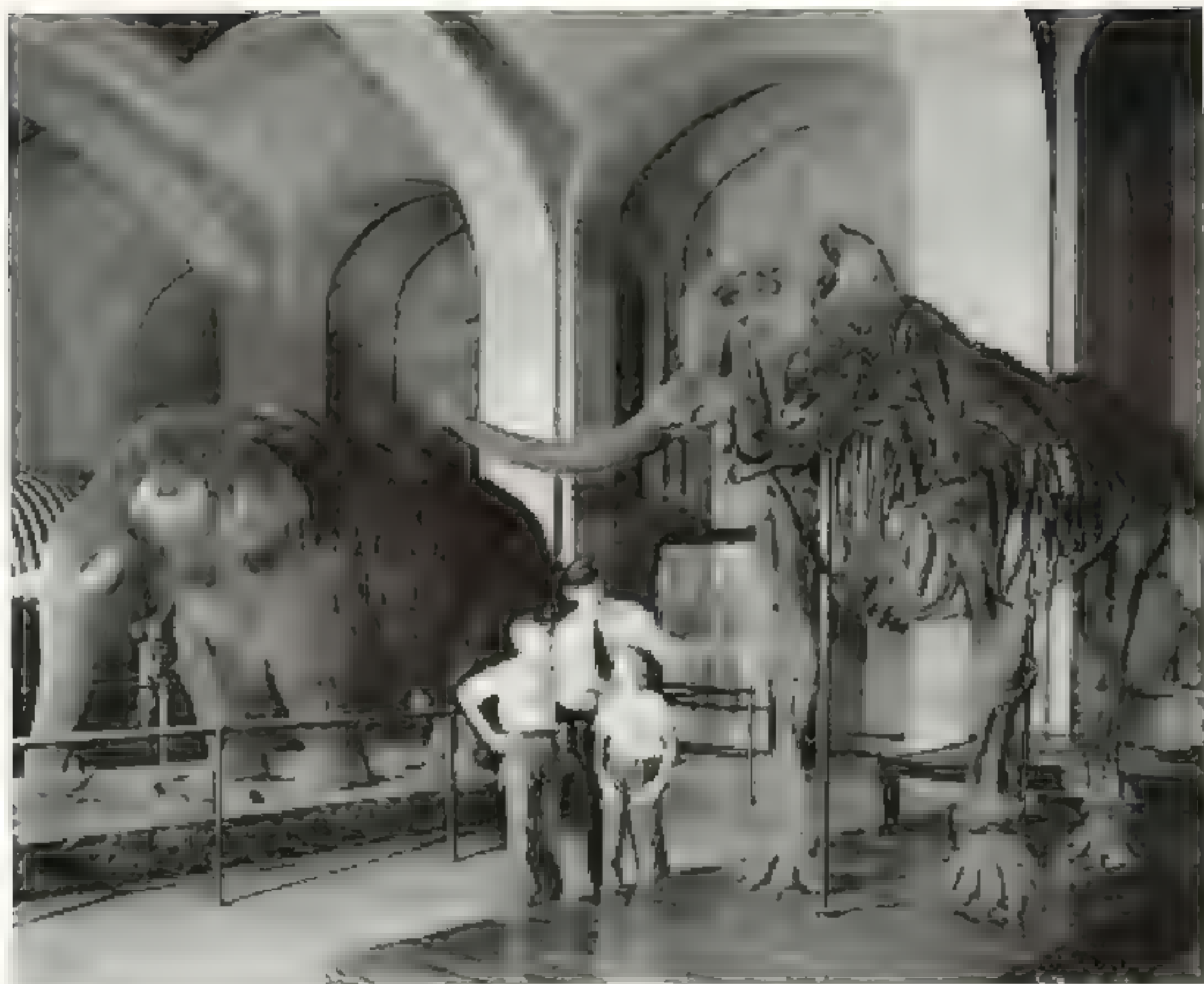
They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk.

They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk. They are all rolled up in the end of the Mohawk.



Handfuls of Dry Ice, Sown by Plane, Made These Snow Clouds Drop Their Load

The following is a list of the names of the persons who have been appointed to the various positions of the Board of Directors of the National Association of Manufacturers, for the year 1914. The names are given in alphabetical order of the names of the persons who have been appointed to the various positions of the Board of Directors of the National Association of Manufacturers, for the year 1914. The names are given in alphabetical order of the names of the persons who have been appointed to the various positions of the Board of Directors of the National Association of Manufacturers, for the year 1914.



"If You Had Lived a Few Thousand Years Ago, You Might Have Seen One of These"

Two visiting visitors to the New York State Museum at Albany stare at the skeleton of a mastodon found 16 feet down in a Mohawk River pothole at Cohoes by workmen digging the foundation for a bridge. You feel a frisson run on down that this shaggy relative of the elephant looked when it roamed the lower Mohawk Valley in the wake of the great Ice Age.

At Schenectady, 17 miles from Albany, Union, founded in 1795, was the first college west of the Hudson. It was established by bringing up of the Mohawk—a people of the Mohawk Valley—who were reluctant to send their sons as far as Harvard, Yale, or Columbia. Union from its start was nonsectarian, and the Hudson region of its founders has marked it thus all the years.

From Union's pleasant, tree-shaded campus have gone forth leaders in many fields, including outstanding engineers, statesmen, judges, missionaries, and college presidents.

Traditionally Union cradled the country's oldest college sports fraternities.

At Schenectady the main roads leave the Mohawk and lead directly toward Albany and the Hudson across two pinelands which gave Schenectady its name, meaning "Trail Through Open Pines." Over this route came Alexander Hamilton when he founded the town in 1790.

In the north the waters of the Mohawk flow toward to the falls of Cohoes and the Hudson Waterway. There at last the stream which in the past has spash pools north as full-grown waters.

But this story's kinship is with the Hudson. The climax of the Mohawk story is reached at Schenectady.

As we have truck along the Mohawk at dusk, Tom said: "You know, there's a charm about this valley. Early in the morning and in the evening, there's a peace and quiet that I haven't seen anywhere else in the world."

So my Valley had won this southerner after all.

But my mood was far from affectionate. "Unless," he added, "it's down South, with smoke curling up from a little cabin and the sun rising over the cotton fields."

I let it go at that; for, beside many an alien race, I have known what it is to see a valley of peace.

British Castles, History in Stone

BY NORMAN W. KISSACK

WHAT tales of derring-do—of secret passages, of mystery, of dark and wild night and storm, of drafty banquet halls dim-lit by guttering torches, of sword play and assassination, of knights in armor, of silken ladies tossing favors to their champions in the jousts, of desperate deeds and intrigues that changed the course of history—are brought to mind by the old castles of England, Scotland, and Wales!

In and around these venerable strongholds the huge stone castles as opposed to the simpler defended mounds of pre-Norman days was enacted much of the tense drama of Britain in medieval times.

Home of Queen a Haunted House

Glamis (pronounced "glahms"), ancestral home of Queen Elizabeth of Great Britain, had its beginnings in the dim past of Scottish history (Plate I). Nearly six centuries ago it came into possession of an ancestor of the Strathmore family, of which Elizabeth is a member. Her forebears, the Earls of Strathmore, are descended from a long line of Scottish kings.

In Glamis Castle, legend says, Macbeth, Thane of Glamis, murdered King Duncan. History does not verify the story, but tradition reveals a deed which took place in the castle is still known as the Duncan Room.

Another popular legend tells of ghosts playing cards with the Devil in a secret room of the castle. Much of the present building was constructed in 1675-87, but parts of it are much older.*

Sir Walter Scott, when a lad of 20, slept in the castle after draining a full measure of wine at a draught from the golden goblet known as the Lion's Cup. He admitted that the "heavy old pile," as he called the building, set his nerves on edge. One of the oldest-inhabited houses in the British Isles, Glamis has few equals in ghostly atmosphere.

Scene of Royal Holidays

After Lady Elizabeth Bowes-Lyon's marriage to the Duke of York in Westminster Abbey in 1923, she and her family went to Glamis every August for a holiday.

To celebrate the marriage, people of the little village of Glamis burned huge bonfires on Hunter's Hill near the castle. Bonfires were lit, too, when Princess Margaret Rose was born at Glamis in August, 1930, and when the Duchess became Queen of England.

Edinburgh Castle occupies a wonderful position, high above the gray city (Plate II). The rock on which the castle stands has been a military site since the seventh century, when Edwin, first Christian King of Northumbria, set up an outpost here called Edwinburgh.

Romance and tragedy are bound up in the stones of this palace and prison, which was one of the strongholds surrendered to Henry II by William the Lion in the Treaty of Falaise in 1174. It was taken in 1313 by Robert Bruce, Earl of Moray, whose warriors scaled the rock wall.

The "Black Dinner" at which the young Earl of Douglas was murdered in 1440 was held in the banquet hall.

The victim, flattered into appearing, was unaware of his danger until an ominous black cat's head, a fatal symbol, was set on the table. He put up a fight, but was overpowered and executed.

In 1566 James VI of Scotland—James I of England—was born here to Mary Stuart.

In the novel *St. Ives*, Robert Louis Stevenson tells the thrilling story of the castle during the Napoleonic Wars, when French military prisoners were confined in its towers.

Today the castle contains a museum and a monument to Scottish troops of World War I.

Windsor, Home of Britain's Kings

Of the great inhabited castles, Windsor, chief residence of the Kings of England for some 850 years, is the outstanding example (Plate III). This home of George VI stands on rising ground in the Thames Valley, with the town of Windsor at its base.

William the Conqueror founded the castle on a steep chalk hill above the river, and additions have enlarged it down the centuries. Much of the present structure dates from Henry III (1216-1272). During World War II Windsor Great Park, south of town, in which fallow deer once roamed at will, was plowed up for wheat and other grains. The deer are no more.

Of Winchester Castle, begun by William the Conqueror and finished by Henry III in 1235, only the Great Hall remains (Plate IV). At its western end hangs a representation of mythical King Arthur's Round Table, a relic believed to have existed in the 13th century. The Round Table, repainted by Henry VIII,

* See "Bonnie Scotland, Pre-war Style," by Isabel Wynn-Hughes in the *Mail*, 1946, National Geographic Magazine.

shows clearly in the etching. In the Great Hall Sir Walter Raleigh was tried.*

A square tower and a chapel (c. 1302) are the oldest surviving buildings of Dornottat Castle, near Stonehaven in Scotland (Plate V), but the intrepid Scottish leader Wallace took an earlier castle on the same site in 1297.

Harlech Castle, in Wales, begun in 1280, is superbly situated on a rocky promontory rising 200 feet above the sea (Plate VI). Three times this stronghold was attacked and taken after sieges lasting many months.

Owen Glendower beat vainly against its impregnability in 1404 until finally, when the garrison inside had been reduced to 21 men, the fortress was forced to surrender. Glendower then established his daughter, wife of the pretender Edmund Mortimer, and her children there. When Glendower had been beaten in the field, his son-in-law defended Harlech for eight months. He finally died of starvation, and the castle yielded.

Its stubborn defense against the Yorkist siege of 1468 inspired the Welsh national anthem, *March of the Men of Harlech*, in which its name lives forever.

In Britain's Civil War, Harlech further maintained its reputation for stalwartness and strength, but was finally taken over by the Welsh brother-in-law of Cromwell.

One of the Oldest Buildings in Britain

Dover Castle (Plate VII), dating from the 12th and 13th centuries, contains the Pharos (c. A. D. 50), a relic of the original Roman fortress. Constructed of Roman bricks and tuff, the Pharos is one of the oldest standing buildings in England. Miraculously, the castle escaped serious damage in World War II, although Dover was under continual bombardment.

The solid grandeur of these great fortresses impresses the beholder. Look at Tantallon Castle, in East Lothian, at the mouth of the Firth of Forth (Plate VIII). Standing right on the cliff a hundred sheer feet above the sea, it offers only one approach by land—a narrow neck of land with sea on three sides. Little short of treachery could reduce such a fortress in the days before modern artillery. Dating from the 14th century, it was the seat of the Douglases.

James V, as a youth, besieged the castle in 1528. A force of 20,000 men, well equipped with artillery and a battering ram, came against it. But his 20-day siege proved unsuccessful, for the thick walls resisted all

attacks. Heavy guns were used to breach the wall. The defenders retreated to the central tower and held out until permitted to surrender on good terms. It fell into ruins in the 18th century.

Arundel Castle is another of the few in this series which are inhabited and in perfect repair (Plate IX). One of the oldest in Britain, it was founded to guard the Aron River's gap here in the chalky South Downs. Much of the present building is modern, and many additions have been made. In early days the seat of the Fitzalans, Earls of Arundel, it passed to the Howards, Dukes of Norfolk, in the 16th century. The castle stands above the little town of Arundel, in Sussex.

In the siege of 1643, Sir William Waller broke through the defenses in the town and attacked the castle. Seventeen days of heavy siege finally forced the defenders to capitulate. After the battle Arundel stood a ruin until the tenth Duke of Norfolk began to reconstruct it in 1780. At tremendous cost it was restored to more than its original magnificence.

To make way for modern barracks, most of the historic buildings of 13th-century Stirling Castle (Plate X) have been sacrificed, but the Chapel Royal, rebuilt in 1594, still exists beside a small garden from which a flight of steps ascends to the Douglas Room. In this room in 1452 James II stabbed the Earl of Douglas and flung his body out the window.

The country about Stirling is rife with drama, for near by is the field of Bannockburn where Robert Bruce and his little army of Scots defeated a host led by Edward in 1314.

Stirling Castle had an important role in British history. In 1304 it was captured by Edward I of England after a siege of three months, but ten years later it was retaken by Bruce after Bannockburn. James II, and probably James III and James IV, were born here, and in the High Church the infant Mary Queen of Scots was crowned. Key fortress of Scotland, Stirling was a mighty factor in its defense.

Kendworth, Home of Romance

The history of Kendworth (Plate XI) is wrapped up in one of the greatest periods of England. In its prime it ranked among the most important fortresses in the realm.

Commanding gently rolling country on a tributary of the Avon, Kendworth was founded by Geoffrey de Clinton, Treasurer of Henry I, about 1120.

In 1562 Queen Elizabeth presented the

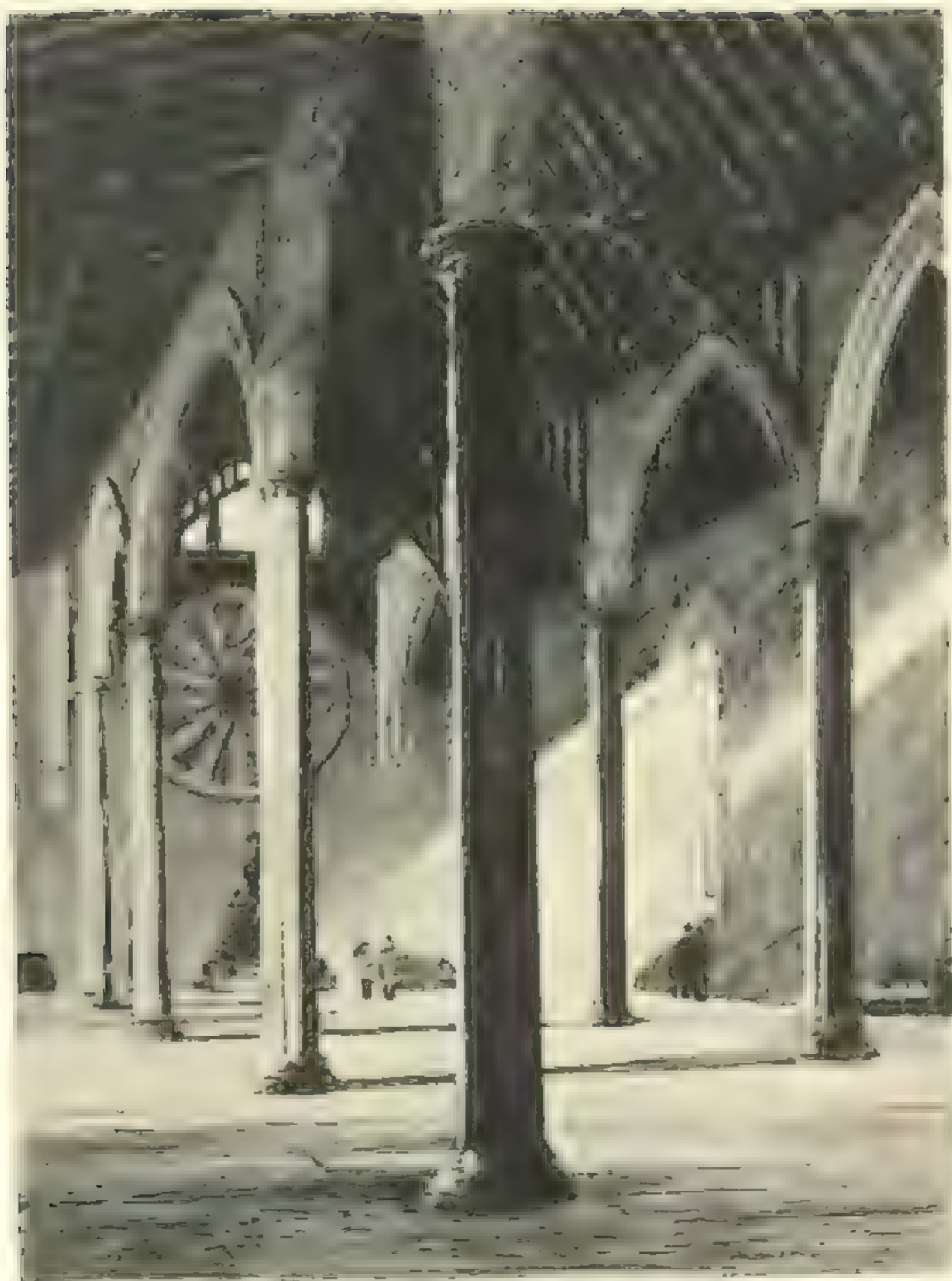
* See "Winchester, England's Early Capital," by Frederick Simphill, NATIONAL GEOGRAPHIC MAGAZINE, January, 1941.

UNIVERSITY BUILDING SEAT OF SCOTTISH KINGS





WINDSOR ROYAL RESIDENCE SINCE THE DAYS OF THE CONQUEROR



THE BRIDGE AT RALPH, N.H.

A. C. HESTER, SURV. OF RALPH, N.H.



DUNNOTAR STRONGHOLD OF SCOTTISH CHIEF



VIEW FROM CHAI A CLIFFS LOOKS ACROSS THE CHANNEL TO HANU



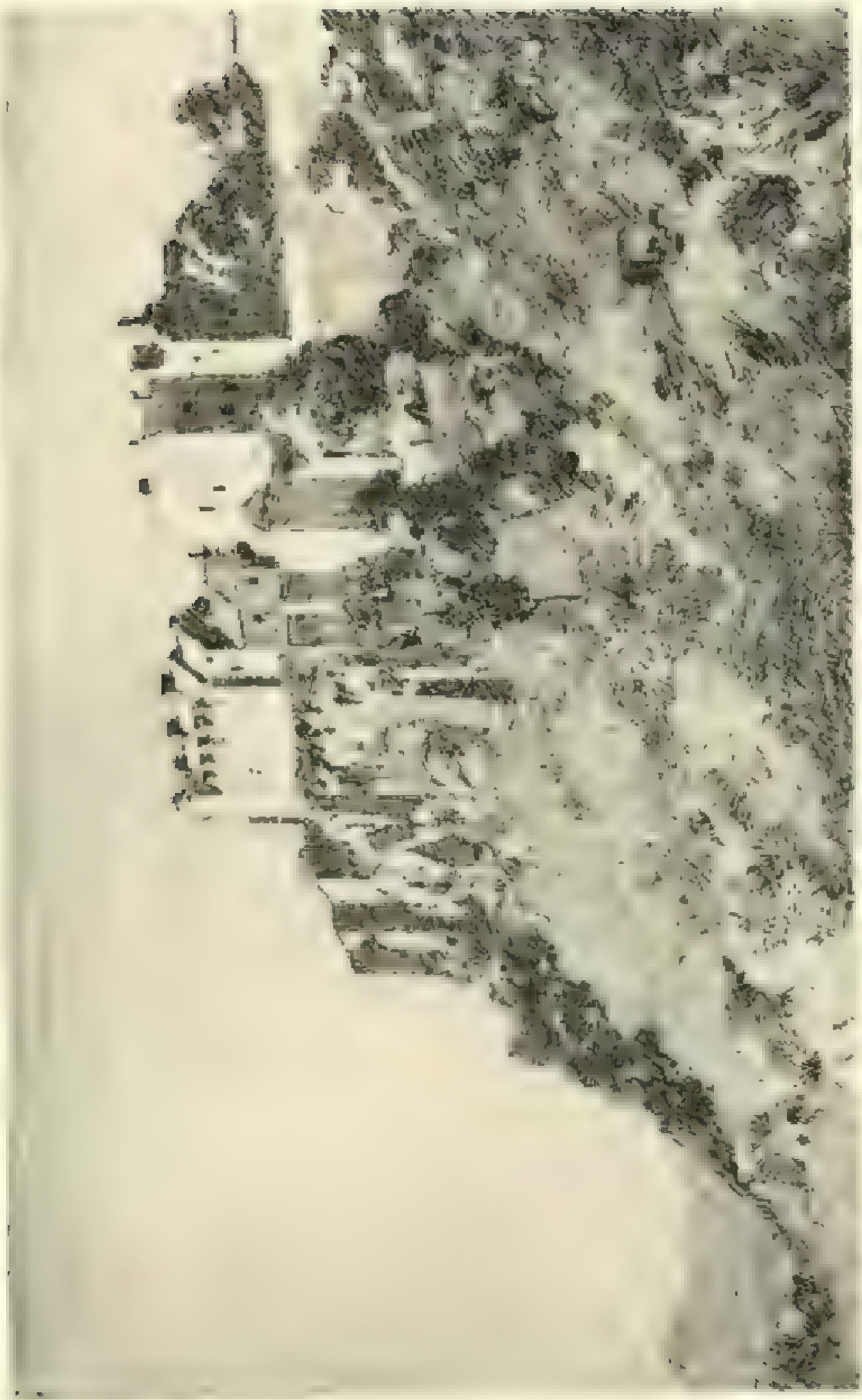


PANJALION. REFUGE OF A SCOTTISH BOY KING. JAMES V



THE MUSEUM OF THE CITY OF LONDON

AROUND ONE OF BRITAIN'S OLDEST



STIRLING HOUSE THE FIRST MARCH 1871

NEWLWORTH SCENE OF PLEASURES DESCRIBED BY SCOTT









WARWICK COUNTY PRISON OF EDWARD A.



LEIDS. WHARF AREA. 1900. 11. 1. 11. 11.



RODAM ON THE RIVER ROTHER IN SUSSEX

castle to Robert Dudley, Earl of Leicester, who spent enormous sums enlarging it and entertained his royal patroness here in the magnificent style described by Scott in *Kennilworth*.

When Cromwell gave the castle to some of his officers, they demolished it and divided the land into farms for themselves. After the Restoration it passed, hopelessly ruined, into the possession of the Earls of Charendon.

Even as Kenilworth stands today, stark and deserted, something of its old magnificence remains.

A confined fortress and fortified town with a mile of walls and 21 towers is Conway Castle, in north Wales (Plate XII). Built for King Edward I by Henry de Eborac, it was completed in 1254. It remained intact until the Great Rebellion, when it underwent two sieges. In 1665 it was plundered of all its usable timber, lead, and iron.

Conway Built for the Ages

Conway is so well constructed that when part of a tower fell out through undermining, it did not disintegrate and was difficult to break apart for restoration.

Few of the castles I visited are inhabited, but some are being protected from decay, by the National Trust* and by other means. Some, like Caernarvon and Warwick allow us to picture their former grandeur (Plates XIII and XIV). Think of them in their heyday, standing gaunt and menacing but peopled with knights and ladies, men-at-arms and retainers—small, self-contained towns.

Since books were few, and the ability to read was a rare feat, the fortress dwellers must have had little to talk about. News traveled slowly, and a courier was their only contact with the outside world. Nevertheless, they seem to have been fully as happy as we. We are entertained; they entertained themselves.

Castles built for military purposes reached their apex in the early 14th century, when the government of England was carried on within their walls. From that time the need for great fortified strongholds began to decline.

Caernarvon is similar to Conway in arrangement, but it is easily distinguishable by its polygonal towers. The castle stands on a rocky platform commanding the southwestern end of the Menai Strait in Wales. There are two main entrances—the King's Gate on the north and the Queen's Gate on the east.

Caernarvon was the most important of Edward I's six fortresses in Wales.

In 1213 Isabella, daughter of Alfred the Great, is believed to have made a strong fortification on the site of Warwick Castle (Plate XIV), which lies along the Avon and

is the seat of the Earl of Warwick. William the Conqueror founded a castle here.†

Leeds Castle, though much altered since its beginning in the 13th century, retains the atmosphere of its period (Plate XV). Still inhabited, it is in perfect repair. It has an exquisite setting, being almost entirely surrounded by water and backed by woods.

When Queen Isabella, fragile wife of Edward II, came one night to demand admission to the castle, the castellan refused, being without the King's orders. At the same time he sent forth a shower of arrows. The Queen then influenced the King to have the castle besieged. The castellan was captured with 11 others and hanged above the drawbridge.

Here Henry V received Emperor Sigismund and imprisoned his stepmother Joan for practicing witchcraft. For the same alleged offense, Eleanor, wife of good Duke Humphrey of Gloucester, was tried here.

This romantic castle in Kent also has American connections, for it was the home of Lord Culpeper, early Governor of Virginia, and of his grandson, Lord Fairfax, patron of the young George Washington.

At the time of my visit to Leeds it was a military hospital. The coming and going of Army vehicles and the presence of nurses and soldier patients seemed to recapture some of the life of its early days. This vitality is denied to many of the castles, somber ruins having no occupants but pigeons, bats, or perhaps a solitary vixen raising her howl amid the fallen masonry.

In Sussex, on the River Rother, stands Bodiam Castle (Plate XVI), built in 1386 and dismantled during the Civil War. It was erected by Sir Edward Dalyngrigge, who served under the Black Prince in France and used it as a castle of war. He lived in himself in a castle as a manor lord. Bodiam was built all at once.

As I sketched these castles, I contrasted them with the cathedrals which I had previously drawn for the NATIONAL GEOGRAPHIC MAGAZINE.‡ With few exceptions, the castles were lifeless ruins, all pageantry gone. But the cathedrals, with glorious stained glass and carving all in perfect order, were living things which even the German bombing hosts had left almost untouched. Cathedrals of religion stand intact, while many of the castles, built for war, are in ruins.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Preservation of England's Historic and Scenic Treasures," by Eric Liddellwood, April, 1936.

† See "How Warwick Was Photographed in Color," by Maynard Owen Williams, July, 1936.

‡ See "Cathedrals of England," by Norman Wilson, December, 1936.



1

Imagine Meeting This Lovely "Mermaid" Deep in Blue Waters Deep in a Lagoon!

[illegible]

Adventures with the Survey Navy

By IRVING JOHNSON

THIS is the story of the "Survey Navy." It is told tentatively, for little could be said during the war. Now, though peace has come, few citizens have any realization of the important part that survey crews played in winning the war in the Pacific.

"Survey Navy" was the nickname affectionately bestowed upon the survey ships of the Navy's Hydrographic Office by the men who served them.

Not much fighting was expected of these lightly armed vessels. Their job was to chart a route to Tokyo through a constellation of question-mark islands and past vicious reefs lurking in ambush for ships. Survey Navy, often working ahead of the fighting fleets, had to blaze a trail beset by the deadliest hazards of man and Nature (map, page 133).

War in the remotest recesses of the Pacific compelled the Navy to rely in many instances on navigational charts a century old. These bore the vaguest directions, such as "This island reported to lie 11 miles ENE of position shown," or "Many uncharted reefs exist; proceed with native pilot and good light."

As one consequence of the lack of charts, the U. S. S. *South Dakota*, one of the few American battleships in the South Seas during the desperate summer of 1942, ripped her bottom on an unreported coral head.

Old Chart Costs Japan a Battle

Japan's costliest example demonstrated the folly of attempting an invasion without accurate charts.

On a gloomy night off New Guinea in August, 1942, the enemy fleet groped into Milne Bay with the aid of the best available chart—one printed by the British nearly a hundred years ago.

Twelve miles up the bay the Japanese landed, expecting to surprise the Australian airfield and its defenders. Too late the Nips found themselves mired in a swamp three miles from their goal. Many were slaughtered by the Aussies; others were thrown back into the sea.

This disaster, the direct result of a faulty chart, broke the back of the enemy's drive on Australia.

My work as a civilian steered me into the Hydrographic Office's surveys. As owner and skipper of the *Fanker*, a schooner carrying 6,000 square feet of sail, I had explored scores of little-known Pacific islands.* Long before the war, prowls around the coral atolls convinced me that charts were grossly inadequate.

War caught me in Hawaii, advising the Navy on locations for new South Sea bases. In Pearl Harbor stood the U. S. S. *Summer*, the Navy's special survey ship, then a veteran of 20 years' service. Originally the U. S. S. *Barkend*, a submarine tender, she had been converted into a survey ship in 1938 (page 132). *Summer* got off to a fighting start December 7, 1941, when one of her three-inch guns exploded the first Japanese torpedoplane in mid-air.

Destiny brought us together. Of all the Navy assignments available, none could have suited me better than duty as navigator aboard the *Summer*, with rank of Lieutenant Commander. I was eager to make charts. What I never counted on was the adventure attending a pencil-and-paper job.

We Take Over a Coral Solitude

In 1942 the *Summer* was detailed to land Marines and take over the Wallis Islands (Iles Wallis), a French-owned group between Samoa and Fiji. I was assigned to the party because, I believe, I was the only Navy man who had been to Wallis before the war.

I remembered from my *Pontac* days that Uvéa, the main island of the Wallis group, was surrounded by a coral reef whose dangerous lagoon channel already had claimed several ships. For safety's sake, we entered the channel on a slack tide, which lasted barely 15 minutes.

As pilot, I took station in the crow's nest. There I looked deep into the clear water, just as I did from the *Pontac*'s square-sail yard a few years earlier. We were nervous lest an enemy shell end our survey before it began.

Quietly we sneaked into the lagoon and anchored, hoping we hadn't been detected. Then we heaved for shore in motor whaleboats and survey boats. In this stage of the war, none of us dreamed of the ingenious assault landing craft still to come.†

My job was to lead the small boats across the reef-choked lagoon, plant buoys to show others the way, and locate a landing place.

For a quarter-hour our open whaleboat made a perfect target, but not a shot rang out. The jungle remained silent but ominous. Where were the Japanese, I wondered.

Beating the Marines ashore for once, I ran

* See "Westward Bound in the *Fanker*," by Irving Johnson, NATIONAL GEOGRAPHIC MAGAZINE, January, 1942.

† See "Landing Craft," by M. J. Bell-Greenwood, NATIONAL GEOGRAPHIC MAGAZINE, July, 1944.



U. S. S. *Albatross*, Commanded by Surgeon Navy. Thrice in War's Close Tangles.

Whenever the amphibious forces were sent into the Pacific there went the light cruiser *Summer*, sometimes called the fishing ship. In four years it underwent repeated air attacks, but suffered no serious damage. It had gone the first to Pearl Harbor (page 131). Once the 340-ton vessel remained here in a tricky lagoon (page 132) when here off Cebu, Netherlands West Indies, he has still to exchange her white paint for gun.

of the sheltering trees. Then memory guided me a lonely mile through the bush to a native village and the chief's house. Luckily he remembered me. He said we were the first visitors he had seen in 17 months. For once we were ahead of the Japanese.

Since many more Marines were due soon in 1945 too large to enter the lagoon, the *Summer* had a crew to blast out a landing, set markers, plant buoys, and sound a small alarm. Within three days we had sufficient information to prepare a rough chart. I drew the sketch on my knee. A printed copy was handed to each boat crewman as he entered.

Summer a Seagoing Printing Plant

A French-made chart of Wallis looked good on paper, but Hydrographic engineers detected some curious discrepancies. For example, the map showed an extra half-mile of

island which we could find nowhere. Obviously a new chart was needed.

Summer was the ship to do the job. She was a floating print shop, totaling out charts for immediate use. In her drafting room Hydrographic engineers and cartographers spent long hours at their exacting work (page 143). When the hand-drawn chart was complete, photographers and platemakers worked without sleep until they had prepared zinc plates. Then printers, starting the lithographic press, ran off thousands of copies in five colors.

None of these processes meant anything, however, without the essential raw material—a painstaking, accurate survey. To make original surveys the *Summer* carried 14 small boats. They worked around islands and in sheltered waters.

In larger open-water areas the ship herself took soundings on predetermined lines, keep-

ing a record of her exact position. The navigator—remember, I was one—got a daylong workout. He had to plot horizontal sextant angles taken by quartermasters every three to five minutes. He also corraled the ship. When he sighted an undiscovered shoal—and many's the time!—he had to change the ship's course quickly.

However, part of our work was done while the ship was at anchor in harbors and lagoons. There I took a rest as navigator, only to become the *Summer's* diving officer.

In order to make underwater movies, I had learned a little about diving while on the *Tankie*. Now I couldn't wait to learn more.

Learning Dynamite by Trial and Error

My diving started in a certain lagoon in the Walas group which the *Summer* was charting as a battleship and carrier anchorage. As these ships were on their way, we had little time to lose. Imagine our concern when a survey of the entrance channel revealed coral heads—formations built by corals' stony skeletons—which no battleship could pass. Pearl Harbor could not send dynamite specialists in time; so we took on the job. As none of us had done much under water blasting, we started learning the hard way.

Knowing that on the surface one stick of dynamite would knock a 50-gallon drum a hundred feet high, we used a single stick for the first charge under water. For detonation we attached a long wire to an electric cap and then backed off as far as possible. "Ready fire!" For a moment nothing seemed to happen. Finally a bubble rose and burst quietly.

Following that fiasco, we increased the charge till we were using 80 sticks, an entire box at a time. Later, sometimes, we fired 80 boxes in a single charge. Our blasting wire enabled us to back off only 125 yards. Once the shock knocked our whaleboat's engines off their beds and bounced the batteries three feet high. We learned something every day.

So many lagoons were unable to accommodate our big ships that the blasting of coral heads became supremely important. Usually we blasted as we surveyed. Then the cartographers incorporated the changes as they drew their charts.

In many of the South Pacific islands the *Summer* was the first actual sign of war. In the beginning the natives brought gifts of fruits, vegetables, chickens, and tapa cloth. As if for fun, they carried lumber and cement to my untimely aid and cleared jungle paths with machetes.

Native nativeté soon wore off, however. Our hosts stopped fishing and following many



FIG. 13. A Survey Tower

Not an Oil Derrick, but Survey Tower

Five tons of steel beam sawed on a Pacific island. Navy engineers may be volunteers, for their work is hazardous as well as strenuous. In tricks such they handle small boats laden with guns and shells. When they carry steel on the beach, for long distances, they often up mountains. A tower must top trees and hills to give instruments an unobstructed view; so it generally stretches its full 100 feet (page 141).



A Theodolite Delights Childish Uliti Islanders

NEW HAVEN, CONNECTICUT, U. S. A. (Continued from page 123.)—The children of Uliti Island were very curious about the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument.

They were very curious about the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument.

As the work progressed, the children were very interested in the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument.

Meanwhile, the *Summer* continued with her work for the Survey party, New Haven, Conn. P. H. New Haven and the German group. So far, everything had been smooth.

Then we began our work on Salomon Island, where we got our first look at the Japanese Pearl Harbor.

The work was a survey and chart survey. The work was a survey and chart survey.

The work was a survey and chart survey. The work was a survey and chart survey. The work was a survey and chart survey. The work was a survey and chart survey. The work was a survey and chart survey.

As the work progressed, the children were very interested in the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument. They were very interested in the theodolite and the surveying instrument.

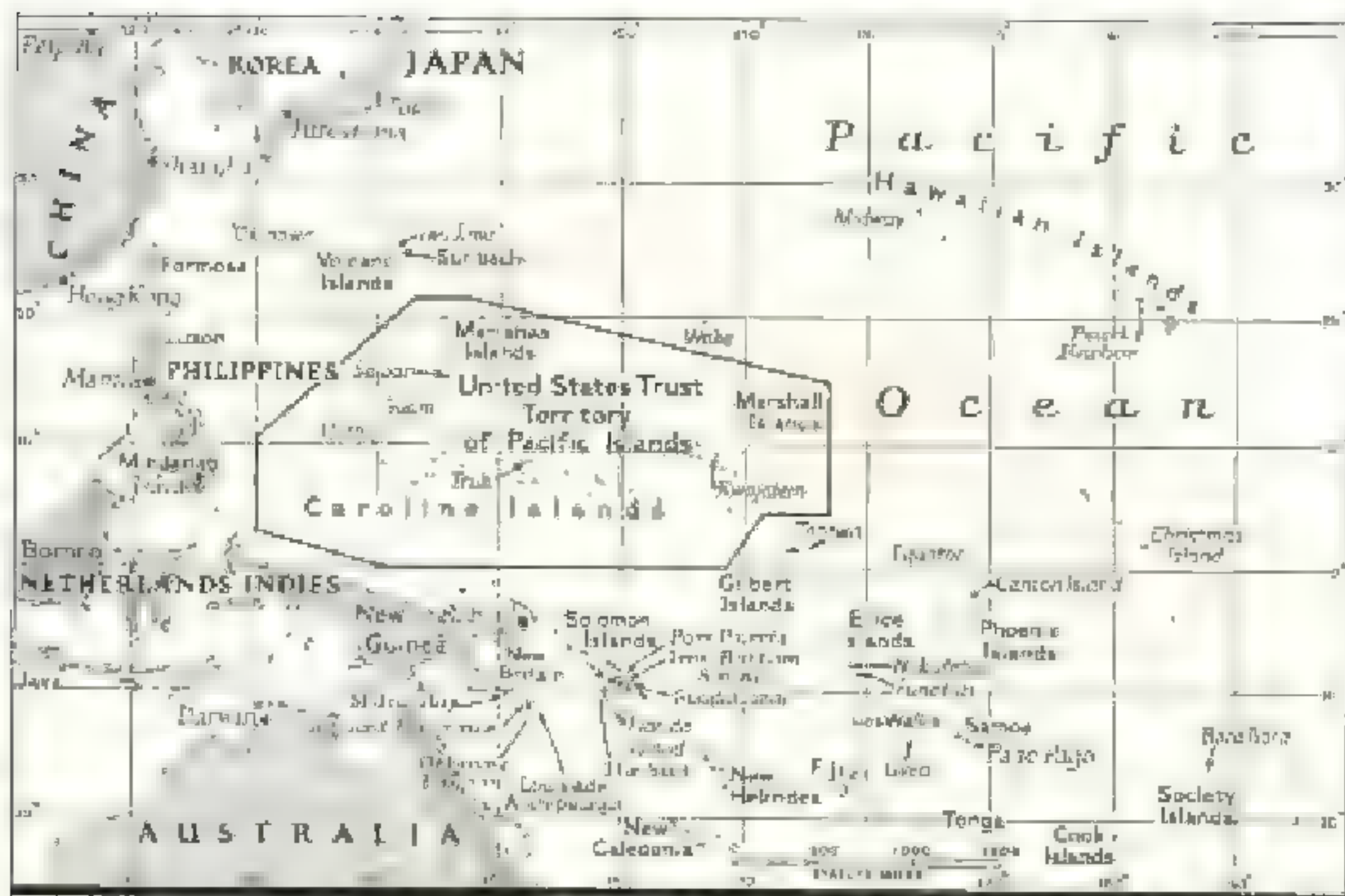
Then we began our work on Salomon Island, where we got our first look at the Japanese Pearl Harbor. The work was a survey and chart survey. The work was a survey and chart survey.

For the next three and a half years the *Summer* turned out to be a very good chart of the area. They were very interested in the theodolite and the surveying instrument.

Divers Learn Secrets of Jap Wreck

Next we got a job on Iron Bottom Sound, the stretch of water between Guadalcanal and Florida. This bay got its name from the many American and Japanese ships sunk there. The enemy's ships were sunk and the work was a survey and chart survey.

The work was a survey and chart survey. The work was a survey and chart survey. The work was a survey and chart survey. The work was a survey and chart survey.



U. S. S. Summer Charted Remote Recesses of the Pacific for Our Fighting Fleet.

With our South Japan base, our charts of remote stretches across were so dated that they were no longer under study. Heavy line on former Jap-held Pacific Islands, and the United States to the United States.



A Wreckboat Fixes the Position of a Ship Sunk by Wire-drawing Vessels.

In this intended and some a double (note the line) of a depth of the water. Some whether the water may be. Here the wire is used to draw the ship. A seaman (left) takes a sounding. Blowers will remove the water. A blow-up of a small boat. These devote long hours to dragging the ship out of the water.



Rising Tide catches a Hydrocomphus larva. A group of people on the beach is the Battle Point scene.



A group of people on the beach. A group of people on the beach is the Battle Point scene.



Up in Smoke Goes an American Laker, Victim of a Billowing Attack in Cloudy Grounds of Lili Lagoon

The Laker, a ship of the U. S. Navy, is shown in the foreground, with a large plume of smoke rising from its funnel. The smoke is thick and dark, contrasting sharply with the lighter sky. In the background, there are faint outlines of buildings or structures along the shoreline.

down another crack, only to find myself blocked by a heavy steel hatch. This door I pried open, but the ship's list, some 40 degrees, immediately swung it shut. Clearly, I was not to be able to hole that hatch—no save a return trip to the surface. I used the string holding up my pants.

Then I blundered downward again. My lifeline twisted around so many corners that I couldn't signal the tender. Stagnant water rose within a few inches of my nose. Clad in open helmet, I could not escape the overwhelming stench.

Meeting the Dead in Davy Jones's Locker

Then, of all the horrors, a mushy, clammy object brushed across my bare stomach. As I pushed it away I felt—or did I imagine?—the sweep of long, cold fingernails. My only thought was to escape at once.

Then in the blackness my helmet struck steel. That hatch had come down, my stout air hose having dislodged the string! Luckily I was still receiving air.

Sudden shock almost caused me to pass out. That emotion was succeeded by terrible anger at myself for having been so careless. (A diver's brain is never quite clear when he is working under pressure.) A flash of self-criticism forced the conclusion that I had to push open the hatch or stay down forever, for we had no extra diving gear for a rescue.

There was agonizing uncertainty until my fingers discovered a way to apply leverage. The hatch slowly lifted.

When I came up, the pumps wondered what had kept me so long.

Months later a Navy salvage crew raised the *Kikatsuki* for a detailed inspection.

Our next big job took us around Delboyai Lagoon, in the Louisiade Archipelago, off the eastern end of New Guinea. Here the *Sumner*, landing a hundred miles ahead of the armed forces, was preparing an alternate way to get at Rabaul, the major Japanese base on New Britain (page 142).

Numbers of enemy planes, bound on missions, flew high overhead. Having spotted the *Sumner*, the Japanese sent a few planes after each raid, but they found nothing. Forewarned, we were surveying over the horizon.



Diver's Pet, a Holo Porpoise, Comes for Air

Some of the most interesting and unusual air-breathing animals I have ever seen are the Holo Porpoises. They are found in the waters of the Pacific Ocean, and are known for their ability to breathe air through their blowholes. They are also known for their playful behavior and their ability to jump out of the water. The Holo Porpoise is a small, sleek, and agile animal, and it is a common sight in the waters of the Pacific Ocean. They are also known for their ability to breathe air through their blowholes, and they are often seen breaching the surface of the water.



Shy but Friendly Natives Meet Visitors to Deloyan Lagoon, Tuamotu Archipelago

From our New Group, the natives came to Deloyan Lagoon, where we were to have a picnic. The natives were very friendly and we had a very good time.

shaped, some were more than a foot and four inches long. When arriving, they have been known to pierce small holes.

During the night, the natives were very friendly and we had a very good time. They were very friendly and we had a very good time. They were very friendly and we had a very good time.

When we saw the natives, I was very surprised. They were very friendly and we had a very good time. They were very friendly and we had a very good time.

At the house, after we were I was very surprised. They were very friendly and we had a very good time. They were very friendly and we had a very good time.

The natives were very friendly and we had a very good time. They were very friendly and we had a very good time.

My attention was attracted by the natives. They were very friendly and we had a very good time. They were very friendly and we had a very good time.

By the way, the natives were very friendly and we had a very good time. They were very friendly and we had a very good time.

The natives were very friendly and we had a very good time. They were very friendly and we had a very good time.



Survey Ship at Sea. Atop the Mast, the Flag on Sandbacht

Survey ship at sea. Atop the Mast, the Flag on Sandbacht. The ship is a small, dark-hulled vessel with a white superstructure. The flag is a dark, rectangular flag with a white cross. The ship is moving through the water, and the sea is visible in the background.

picture labeled "Survey Ship at Sea. Atop the Mast, the Flag on Sandbacht." I had forgotten, however, whether it was the

side mast. This was not the time or place to ponder such a question; I took off for the surface as fast as water would let me. As in an amazing dream, I felt as if I were being chased in slow motion.

At the first opportunity I consulted a natural history text. There I learned that the Japanese had the bad-breasted leopards of the sea. All I could say was that the Japanese must have been deceived

by something better in their homely faces!

Another day a new diver, surfacing in haste, breathlessly reported he had seen the skeletons of men in a submarine graveyard. As I went down to investigate, I too seemed to see a grisly array of sea-bleached bones. Another look revealed the dead, white, staring faces of the men.

To divers, even familiar objects often look distorted. If accidents do not get them down the constant strain keeps their nerves. In the end, the only man out of our 30 divers who was tough enough to stand the gaff for the duration was the only man out of our 30 divers who was tough enough to stand the gaff for the duration.

Japan's Fleet, Bottoms Up, Is Charted

Navy's next big advance took us to the Marshall Islands. There Kwajalein's lagoon, nearly 80 miles long, presented the problem of charting 17 Japanese ships sunk in shallow water. The Japanese ships were from our captures. Like the Japanese ships, they were the only ones that had not been sunk. The Japanese ships were from our captures. Like the Japanese ships, they were the only ones that had not been sunk.

In charting we had little difficulty spotting oil slicks rising from the wrecks. However, it took a wire drag to locate the mooring buoys secured to some. When the damaged ships sank, they pulled down the buoys just far enough to see the propellers moving overhead. Dynamite was used to clear these hazards.

Among the wrecks inspected by the *Sumner* was a 350-foot 5,000-ton ship lying in 110 feet of clear water. Without warning one

"The Japanese Navy's Fleet, Bottoms Up, Is Charted" by W. L. G. "The Japanese Navy's Fleet, Bottoms Up, Is Charted" by W. L. G. "The Japanese Navy's Fleet, Bottoms Up, Is Charted" by W. L. G.

could that Japanese ghost rise from Miss Jones's locker and take her nose 50 feet into the air. We saw the whole lagoon plain with a freighter turned searchlights on the wreck. One hour later he picked up a message and a stream of airplanes. Only one observation set saved me—that the ship was laden with a cargo of tin ore.

Stricken Japanese ships came in handy at times. One day I saw a Japanese ship with a hole in her side and a hole in her bottom. The hole in the bottom was a hole in the steel pipe and I had to go down and weld it. We welded the other aboard ship and went on our way.

Nearly two and a half years after Pearl Harbor the *Summer* entered San Francisco and was overhauled. A repair force knew little of the survey ship's extreme requirements and decided to build a new ship. At this particular time I assumed command of the *Summer*, and I enjoyed ordering everything she needed.

Mr. conditioning was installed for the cartographic charting room and the print shop. A new bridge was designed for survey work. Windows instead of portholes were built in, allowing visibility all around the horizon. Extra strength was provided to ease the strain of the many new guns that were unheard of in 1915, when the *Summer* was built. Before long she took on the look of a multi-decked warship.

It was a real thrill not to have to pay the bill, as I would have had to do for the *Lantern*.

Our next cruise took us 400 miles southwest of Guam to Ulithi, whose lagoon was selected for America's secret naval anchorage.* Time after time more sea power was concentrated



The Author Gets a Comb in a Swap for Tobacco

Yet Ulithi was a beautiful place. The Japanese had taken away the best looking girls. Were they hadn't kidnapped this 15 year-old girl, she would have been a puzzle to us. We couldn't talk a word of her language.

in Ulithi than at any other spot in the Pacific. Though the lagoon was 22 miles long it was too small to hold all the many ships demanding space.

Summer entered Ulithi's lagoon with the aid of a captured Japanese chart. Before long we had our own, a chart showing many improvements. Survey crews charted the edges of the lagoon by blasting coral heads, building navigational buoys, and wire-dragging the bottom. These new risks were a great improvement but did not do for his secret anchorage. Next we had to log enough to require them.

Shortly after we started work, so many

* See "South from Saigon," by W. Robert Allen, *Navy Magazine*, April 1944.



U. S. NAVY OFF.

Quartermasters Shoot Sextant Angles to Fix the Position of Their Sounding Line

Reared from their knees on a mat in a rooming house, I was permitted to observe the work of the quartermasters the third time I was on duty. They were using a sextant to fix the position of the sounding line. Another man, standing on the deck, was using a lead line to measure the depth.

My first job was to go down to the bottom and bring up the sounding line. I had to go down hundreds of steps, all over again, the space, enormously complicated the work and added weeks to the job.

One of the first things I saw on the bottom was a tide gauge. Automatic gauge to measure the tide, it makes a continuous record of the tides. A tide gauge at Uthi showed a sizable jump in the water level. It was a very strange thing. A tank Japan, 1,000 miles away, on the water level.

Hunting Japs' Mysterious Weapon

When the Japanese discovered the ship's position, they tried to attack with their mysterious weapon. The Navy had said that the submarine could enter the Lagoon. The ship's gunners were being hit without warning. The explosion was 1,000.

I had a very good idea of what was going on. I was in the anchorage following our attack. Navy Intelligence wanted to know what I was doing. I was told to find "the thing."

Diver Towed with Air Hose

To help me, the *Swimmer's* crew devised a method of searching the bottom. We used an air hose to tow the diver. I saw how it worked.

The diver was towed by a rope. The rope was pulled by a motor. Then the diver was towed by a rope. The rope moved at a speed of 10 feet above the bottom.

By using the telephone in my diving helmet, I could give directions and report what was going on. When the sun was out, I could see about 10 feet on either side. The experience was like the *Nautilus* in Jules Verne's *Twenty Thousand Leagues Under the Sea*.

The survey of Iwo Jima proved the most thrilling, difficult, and dangerous of all. I shall never forget our approach early one morning.

Mount Suribachi loomed out of the smoke. Flashes rose from the fleet's big guns hammering the Japanese in their hide-outs.

Sumner anchored a thousand yards off the sloping shore at one end of the front line, where the 4th Marines faced the enemy. So close, yet in a way so remote, was the *Sumner* that we seemed to be watching a war movie on a screen. Reality took charge, however, when enemy shells came our way.

Sumner's Expedition to Mount Suribachi

Our first job was to rush a survey for harbor development near the front line. *Sumner's* crew men worked under sniper fire in small boats and beside the Marines ashore. As bullets splashed near by, they found it difficult to concentrate on sextant angles.

Lt. Comdr. John A. Stinton, Chief Hydrographic Engineer, wanted the first survey signal put atop Mount Suribachi, where the Marines had just hoisted the American flag (February 23, 1945).

Though bullets still swirled around the mountain, Ensign L. V. Elliott, a fighting Texan, figured he could make the top with six selected men. Loaded with carbines and fish-fighting equipment, they started out.

Color Guard Returns Safely

Using binoculars, we aboard the ship watched our companions' slow progress. Finally their signal appeared alongside the flag. All seven men came back alive (page 144).

Elliott and his gun-toting gang were detailed to erect more survey signals along the shore. In two weeks, while completing the job, they killed 21 Japanese and captured 6.

It did not take the enemy long to figure out that the yachtlike *Sumner* must be carrying the President of the United States, or at least a cargo of five-star admirals. They poured volleys at us from caves in the hills,

dragging their artillery back into the earth after firing a couple of rounds.

Fortunately, their aim was poor, but a dud did crash aboard, killing one man and wounding three.

Meanwhile, two American destroyers and a cruiser gave us protection by firing over our heads into the gun caves. Every salvo jarred the *Sumner*. Things finally got so hot that we moved back a few hundred yards.

Determination of Iwo Jima's exact position on the planet was a hard job, because the island, built of volcanic ashes, was so loose at the joints that it refused to stay still. We were trying to use the astrolabe, a delicate instrument employed for determining positions by the stars.

Demolition Blasts Shocks Instruments

Gunfire and demolition blasts, shaking the entire island, made observations inaccurate within a thousand yards. Even bulldozer vibrations upset our calculations.

Finally we were compelled to maroon our astrolabe party on a bare but solid patch of rock half a mile from Iwo Jima. There the men built a five-ton concrete pillar to hold the instrument steady and a shelter to ward off the wind.

Disregarding land-mass errors, they were able to locate a spot not much larger than a barrel head. Such extreme accuracy was needed for the sake of secret Loran navigational installations.

Today the war is over, and I am again a civilian skipper, sailing a brigantine; but the survey work is never finished. The Hydrographic Office carries on. Our Navy, Merchant Marine, and Air Forces need more and better charts of the world's far corners.*

* See also, in the NATIONAL GEOGRAPHIC MAGAZINE: "Nobuy's Portrait in the Marooned," by Lt. William Franklin Harper, November, 1943; "Strike Route to Tokyo," by Willard Price, October, 1944; "Admiral—Perch of the China Clipper" by Margaret M. Harris, July, 1945; "American Publishers in the Far East," by William H. Nicholas, May, 1946; and "Your Navy as Peace Insurance" by Allen Chester W. Smith, June, 1946.

Write to the publisher for our Navy and Marine Monthly. Don't forget to include your old address, and the address to which you wish to be sent. If you wish to be sent to a new address, please include your new postal zone number.

NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDING
SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON D. C.

LESLIE B. BROWN, Chairman, Research Council
ALEXANDER WETMORE, Vice Chairman, Research Council

JOHN OLIVER LA GORCE, Vice President
EDWARD A. MERRILL, Secretary
WILLIAM D. HOWELL, Treasurer
MORTIMER D. WYMAN, Librarian

EXECUTIVE STAFF OF THE NATIONAL GEOGRAPHIC SOCIETY

GILBERT GROSVENOR, Editor

JOHN OLIVER LA GORCE, Associate Editor

ARTHUR H. HAYES, Assistant Editor
MELVILLE BELL GROSVENOR, Assistant Editor
JAMES M. GARREY, Assistant Editor
NEWMAN D. MORTON, Assistant Editor
CHARLES F. RICHMOND, Assistant Editor
WILLIAM S. CHAMBERLIN, Assistant Editor
RAYMOND A. WILCOX, Assistant Editor
H. C. GILBERT, Assistant Editor

EDWARD K. SMITH, Assistant Editor
M. A. KENDRICK, Assistant Editor
F. A. BOWMAN, Assistant Editor
ERICK C. WOODRUFF, Assistant Editor
J. C. BROWN, Assistant Editor
J. H. HARRIS, Assistant Editor
J. H. HARRIS, Assistant Editor

FRANKLIN L. FISLER, Assistant Editor
STANFORD OWEN WILLIAMS, Assistant Editor
W. H. BOWMAN, Assistant Editor
J. C. BROWN, Assistant Editor
J. H. HARRIS, Assistant Editor
WALTER BOWMAN, Assistant Editor
K. P. BOWMAN, Assistant Editor

BOARD OF TRUSTEES

CHARLES S. BRYAN, President
WALTER S. GILBERT, Secretary
J. C. BROWN, Treasurer
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President
J. C. BROWN, Vice President
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President

J. C. BROWN, Vice President
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President
J. C. BROWN, Vice President
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President
J. C. BROWN, Vice President
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President

JOHN J. MURPHY, Vice President
CHARLES F. RICHMOND, Vice President
WALTER S. GILBERT, Vice President
J. C. BROWN, Vice President
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President
J. C. BROWN, Vice President
J. H. HARRIS, Vice President
ALEXANDER WETMORE, Vice President

ORGANIZED FOR THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE

One year ago, the National Geographic Society, organized in the year 1890, celebrated its twentieth anniversary. The Society has grown from a small group of enthusiasts to a large organization with a membership of over 100,000. The Society has published the National Geographic Magazine, which has become one of the most popular and influential magazines in the world. The Society has also conducted numerous expeditions and researches, and has established a large collection of geographical specimens and maps. The Society has been instrumental in the discovery of many new geographical facts and has played a significant role in the advancement of geographical knowledge.

The Society has been instrumental in the discovery of many new geographical facts and has played a significant role in the advancement of geographical knowledge. The Society has been instrumental in the discovery of many new geographical facts and has played a significant role in the advancement of geographical knowledge. The Society has been instrumental in the discovery of many new geographical facts and has played a significant role in the advancement of geographical knowledge. The Society has been instrumental in the discovery of many new geographical facts and has played a significant role in the advancement of geographical knowledge.

"THEY WANT DELIVERY TOMORROW . . . HAVE WE GOT TIME?"



Yes! **THE AIRLINES GAIN YOU** *Time...Time...TIME!*

Time means money, from sale to delivery. That's why it pays to ship and travel wisely. If excessive travel time has kept you from rich markets, profitable business opportunities or real vacations . . . it's time you tried the airlines. On silverwing the airlines bring you time, time, time!

To gain maximum savings in time, fly the air-buses that are equipping with stock standard Martin 20-2 and 30-3 transports, 100 miles per hour faster than present twin-engine units.

ports, these comfortable, dependable airliners, now the clock to get you there hours sooner. If you relish comfort . . . if speed's your thing

travel and ship by ultra-modern Martin
airliner! THE GLENN L. MARTIN COMPANY,
BALTIMORE 3, MARYLAND.

Travel or Ship by Martin Transport on These Great Airlines

BILACOFF INTERNATIONAL - UNITED + KATHAWEST - RITA
CAMACHO - CUBA - ...
...
AIR BONES CANON - U.S. - W.J.B.

[Home](#) | [About Us](#) | [Contact Us](#) | [Privacy Policy](#)

Amundsen was the first to explore the interior of the continent. In 1906 he led the first expedition to the interior of Alaska, and in 1908 he led the first expedition to the interior of the continent. He was the first to reach the North Pole, and he was the first to reach the South Pole. He was the first to reach the North Pole, and he was the first to reach the South Pole. He was the first to reach the North Pole, and he was the first to reach the South Pole.



AIRCRAFT

[Return to Table of Contents](#)



Aircraft Fuel tank

... construction material furnished to U.S.
... in conjunction with Washington Electric
...
... for living in house for searching field

GET THIS **FREE** BOOK

1. *Chlorophyll a* (Chl *a*)
 2. *Chlorophyll b* (Chl *b*)
 3. *Chlorophyll c* (Chl *c*)
 4. *Chlorophyll d* (Chl *d*)
 5. *Chlorophyll e* (Chl *e*)
 6. *Chlorophyll f* (Chl *f*)
 7. *Chlorophyll g* (Chl *g*)
 8. *Chlorophyll h* (Chl *h*)
 9. *Chlorophyll i* (Chl *i*)
 10. *Chlorophyll j* (Chl *j*)
 11. *Chlorophyll k* (Chl *k*)
 12. *Chlorophyll l* (Chl *l*)
 13. *Chlorophyll m* (Chl *m*)
 14. *Chlorophyll n* (Chl *n*)
 15. *Chlorophyll o* (Chl *o*)
 16. *Chlorophyll p* (Chl *p*)
 17. *Chlorophyll q* (Chl *q*)
 18. *Chlorophyll r* (Chl *r*)
 19. *Chlorophyll s* (Chl *s*)
 20. *Chlorophyll t* (Chl *t*)
 21. *Chlorophyll u* (Chl *u*)
 22. *Chlorophyll v* (Chl *v*)
 23. *Chlorophyll w* (Chl *w*)
 24. *Chlorophyll x* (Chl *x*)
 25. *Chlorophyll y* (Chl *y*)
 26. *Chlorophyll z* (Chl *z*)
 27. *Chlorophyll aa* (Chl *aa*)
 28. *Chlorophyll ab* (Chl *ab*)
 29. *Chlorophyll ac* (Chl *ac*)
 30. *Chlorophyll ad* (Chl *ad*)
 31. *Chlorophyll ae* (Chl *ae*)
 32. *Chlorophyll af* (Chl *af*)
 33. *Chlorophyll ag* (Chl *ag*)
 34. *Chlorophyll ah* (Chl *ah*)
 35. *Chlorophyll ai* (Chl *ai*)
 36. *Chlorophyll aj* (Chl *aj*)
 37. *Chlorophyll ak* (Chl *ak*)
 38. *Chlorophyll al* (Chl *al*)
 39. *Chlorophyll am* (Chl *am*)
 40. *Chlorophyll an* (Chl *an*)
 41. *Chlorophyll ao* (Chl *ao*)
 42. *Chlorophyll ap* (Chl *ap*)
 43. *Chlorophyll aq* (Chl *aq*)
 44. *Chlorophyll ar* (Chl *ar*)
 45. *Chlorophyll as* (Chl *as*)
 46. *Chlorophyll at* (Chl *at*)
 47. *Chlorophyll au* (Chl *au*)
 48. *Chlorophyll av* (Chl *av*)
 49. *Chlorophyll aw* (Chl *aw*)
 50. *Chlorophyll ax* (Chl *ax*)
 51. *Chlorophyll ay* (Chl *ay*)
 52. *Chlorophyll az* (Chl *az*)
 53. *Chlorophyll aza* (Chl *aza*)
 54. *Chlorophyll abz* (Chl *abz*)
 55. *Chlorophyll acz* (Chl *acz*)
 56. *Chlorophyll adz* (Chl *adz*)
 57. *Chlorophyll aez* (Chl *aez*)
 58. *Chlorophyll afz* (Chl *afz*)
 59. *Chlorophyll agz* (Chl *agz*)
 60. *Chlorophyll ahz* (Chl *ahz*)
 61. *Chlorophyll aiz* (Chl *aiz*)
 62. *Chlorophyll ajz* (Chl *ajz*)
 63. *Chlorophyll akz* (Chl *akz*)
 64. *Chlorophyll alz* (Chl *alz*)
 65. *Chlorophyll amz* (Chl *amz*)
 66. *Chlorophyll anz* (Chl *anz*)
 67. *Chlorophyll aoz* (Chl *aoz*)
 68. *Chlorophyll apz* (Chl *apz*)
 69. *Chlorophyll aqz* (Chl *aqz*)
 70. *Chlorophyll arz* (Chl *arz*)
 71. *Chlorophyll asz* (Chl *asz*)
 72. *Chlorophyll atz* (Chl *atz*)
 73. *Chlorophyll auz* (Chl *auz*)
 74. *Chlorophyll avz* (Chl *avz*)
 75. *Chlorophyll awz* (Chl *awz*)
 76. *Chlorophyll axz* (Chl *axz*)
 77. *Chlorophyll ayz* (Chl *ayz*)
 78. *Chlorophyll ayz* (Chl *ayz*)
 79. *Chlorophyll azz* (Chl *azz*)
 80. *Chlorophyll azaa* (Chl *aza*)
 81. *Chlorophyll abz* (Chl *abz*)
 82. *Chlorophyll acz* (Chl *acz*)
 83. *Chlorophyll adz* (Chl *adz*)
 84. *Chlorophyll aez* (Chl *aez*)
 85. *Chlorophyll afz* (Chl *afz*)
 86. *Chlorophyll agz* (Chl *agz*)
 87. *Chlorophyll ahz* (Chl *ahz*)
 88. *Chlorophyll aiz* (Chl *aiz*)
 89. *Chlorophyll ajz* (Chl *ajz*)
 90. *Chlorophyll akz* (Chl *akz*)
 91. *Chlorophyll alz* (Chl *alz*)
 92. *Chlorophyll amz* (Chl *amz*)
 93. *Chlorophyll anz* (Chl *anz*)
 94. *Chlorophyll aoz* (Chl *aoz*)
 95. *Chlorophyll apz* (Chl *apz*)
 96. *Chlorophyll aqz* (Chl *aqz*)
 97. *Chlorophyll arz* (Chl *arz*)
 98. *Chlorophyll asz* (Chl *asz*)
 99. *Chlorophyll atz* (Chl *atz*)
 100. *Chlorophyll auz* (Chl *auz*)
 101. *Chlorophyll avz* (Chl *avz*)
 102. *Chlorophyll awz* (Chl *awz*)
 103. *Chlorophyll axz* (Chl *axz*)
 104. *Chlorophyll ayz* (Chl *ayz*)
 105. *Chlorophyll ayz* (Chl *ayz*)
 106. *Chlorophyll azz* (Chl *azz*)
 107. *Chlorophyll azaa* (Chl *aza*)
 108. *Chlorophyll abz* (Chl *abz*)
 109. *Chlorophyll acz* (Chl *acz*)
 110. *Chlorophyll adz* (Chl *adz*)
 111. *Chlorophyll aez* (Chl *aez*)
 112. *Chlorophyll afz* (Chl *afz*)
 113. *Chlorophyll agz* (Chl *agz*)
 114. *Chlorophyll ahz* (Chl *ahz*)
 115. *Chlorophyll aiz* (Chl *aiz*)
 116. *Chlorophyll ajz* (Chl *ajz*)
 117. *Chlorophyll akz* (Chl *akz*)
 118. *Chlorophyll alz* (Chl *alz*)
 119. *Chlorophyll amz* (Chl *amz*)
 120. *Chlorophyll anz* (Chl *anz*)
 121. *Chlorophyll aoz* (Chl *aoz*)
 122. *Chlorophyll apz* (Chl *apz*)
 123. *Chlorophyll aqz* (Chl *aqz*)
 124. *Chlorophyll arz* (Chl *arz*)
 125. *Chlorophyll asz* (Chl *asz*)
 126. *Chlorophyll atz* (Chl *atz*)
 127. *Chlorophyll auz* (Chl *auz*)
 128. *Chlorophyll avz* (Chl *avz*)
 129. *Chlorophyll awz* (Chl *awz*)
 130. *Chlorophyll axz* (Chl *axz*)
 131. *Chlorophyll ayz* (Chl *ayz*)
 132. *Chlorophyll ayz* (Chl *ayz*)
 133.

11

Figure 1

Category	Value	Unit
...



Maybe you'll never be this lucky...

Maybe you'll never get a chance to photograph the Taj Mahal...

But you *can* take pictures that are just as precious as this.

May we recommend a film that will let you keep the story you want to tell — for the present at least — with wide-angle Anso film in your camera?

For this wide latitude with a few more over- or underexposures, you can't lose on Anso Color film.

Perfect exposure — for each exposure, of course. Next to it, only the exposure is wide

angle Anso film. Anso, Broadway, N.Y.
P.S. — Anso film is available in 35mm and 16mm
Color film.

ASK FOR



FILM & CAMERAS

How to stay out of this doghouse! ↓

Doghouse . . . Let's let Executive men!

To enter, do any of the following.
Believe it or not, you can get out of
this doghouse by any one of the following
methods.

1. If you are a dog, you can get out of
this doghouse by any one of the following
methods. If you are a dog, you can get out of
this doghouse by any one of the following
methods.

2. If you are a dog, you can get out of
this doghouse by any one of the following
methods. If you are a dog, you can get out of
this doghouse by any one of the following
methods.

3. If you are a dog, you can get out of
this doghouse by any one of the following
methods. If you are a dog, you can get out of
this doghouse by any one of the following
methods.



The Dictaphone Method keeps you out from under!



Problems quickly disappear— Just dictate
and the Dictaphone will do the rest for you.
Dictating Machines.

What can the Dictaphone do for you? It can
do anything you can think of. It can do the
Dictaphone. It can do the Dictaphone. It can
do the Dictaphone. It can do the Dictaphone.

Call your local representative for a demon-
stration of the Dictaphone. Write Dicta-
phone Corporation, Dept. 17, 120 Broadway,
New York 27, N.Y.

DICTAPHONE *Electronic Dictation*

Dictaphone Corporation, 120 Broadway, New York 27, N.Y. Dictaphone Corporation, 120 Broadway, New York 27, N.Y. Dictaphone Corporation, 120 Broadway, New York 27, N.Y.

GET MORE OUT OF LIFE WITH TELEVISION



*Get the most
out of television with a DuMont Teleset™*

DuMont's outstanding performance is proven by appeal.

When you look DuMont's Teleset with other sets.

Compare the size, the clarity, the range.

Compare the picture quality. Compare the ease of
adjusting picture, sound, and working life of the cabinet.

See and hear the new DuMont Teleset.

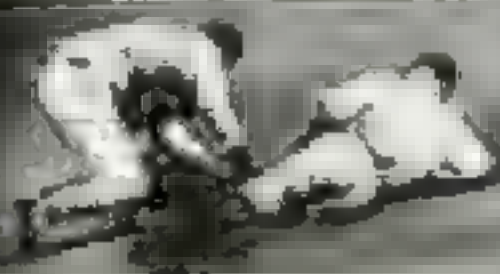
an authorized DuMont dealer to see, hear, and compare.

DU MONT

First with the finest in Television



DU MONT'S
WADD
NEW YORK STATION



ALL IN DU MONT LABORATORIES, INC. • 400 WEST 111TH STREET • NEW YORK 25, N.Y. • DU MONT TELEVISION STATION, NEW YORK •
Copyright © 1954, DuMont Laboratories, Inc.

FOR A DISCRIMINATING FEW!


$$\begin{aligned} \mathcal{F}_1 &= \{f_1, f_2, f_3, f_4, f_5, f_6, f_7, f_8, f_9, f_{10}, f_{11}, f_{12}, f_{13}, f_{14}, f_{15}, f_{16}, f_{17}, f_{18}, f_{19}, f_{20}, f_{21}, f_{22}, f_{23}, f_{24}, f_{25}, f_{26}, f_{27}, f_{28}, f_{29}, f_{30}, f_{31}, f_{32}, f_{33}, f_{34}, f_{35}, f_{36}, f_{37}, f_{38}, f_{39}, f_{40}, f_{41}, f_{42}, f_{43}, f_{44}, f_{45}, f_{46}, f_{47}, f_{48}, f_{49}, f_{50}, f_{51}, f_{52}, f_{53}, f_{54}, f_{55}, f_{56}, f_{57}, f_{58}, f_{59}, f_{60}, f_{61}, f_{62}, f_{63}, f_{64}, f_{65}, f_{66}, f_{67}, f_{68}, f_{69}, f_{70}, f_{71}, f_{72}, f_{73}, f_{74}, f_{75}, f_{76}, f_{77}, f_{78}, f_{79}, f_{80}, f_{81}, f_{82}, f_{83}, f_{84}, f_{85}, f_{86}, f_{87}, f_{88}, f_{89}, f_{90}, f_{91}, f_{92}, f_{93}, f_{94}, f_{95}, f_{96}, f_{97}, f_{98}, f_{99}, f_{100}\} \\ \mathcal{F}_2 &= \{f_1, f_2, f_3, f_4, f_5, f_6, f_7, f_8, f_9, f_{10}, f_{11}, f_{12}, f_{13}, f_{14}, f_{15}, f_{16}, f_{17}, f_{18}, f_{19}, f_{20}, f_{21}, f_{22}, f_{23}, f_{24}, f_{25}, f_{26}, f_{27}, f_{28}, f_{29}, f_{30}, f_{31}, f_{32}, f_{33}, f_{34}, f_{35}, f_{36}, f_{37}, f_{38}, f_{39}, f_{40}, f_{41}, f_{42}, f_{43}, f_{44}, f_{45}, f_{46}, f_{47}, f_{48}, f_{49}, f_{50}, f_{51}, f_{52}, f_{53}, f_{54}, f_{55}, f_{56}, f_{57}, f_{58}, f_{59}, f_{60}, f_{61}, f_{62}, f_{63}, f_{64}, f_{65}, f_{66}, f_{67}, f_{68}, f_{69}, f_{70}, f_{71}, f_{72}, f_{73}, f_{74}, f_{75}, f_{76}, f_{77}, f_{78}, f_{79}, f_{80}, f_{81}, f_{82}, f_{83}, f_{84}, f_{85}, f_{86}, f_{87}, f_{88}, f_{89}, f_{90}, f_{91}, f_{92}, f_{93}, f_{94}, f_{95}, f_{96}, f_{97}, f_{98}, f_{99}, f_{100}\} \\ \mathcal{F}_3 &= \{f_1, f_2, f_3, f_4, f_5, f_6, f_7, f_8, f_9, f_{10}, f_{11}, f_{12}, f_{13}, f_{14}, f_{15}, f_{16}, f_{17}, f_{18}, f_{19}, f_{20}, f_{21}, f_{22}, f_{23}, f_{24}, f_{25}, f_{26}, f_{27}, f_{28}, f_{29}, f_{30}, f_{31}, f_{32}, f_{33}, f_{34}, f_{35}, f_{36}, f_{37}, f_{38}, f_{39}, f_{40}, f_{41}, f_{42}, f_{43}, f_{44}, f_{45}, f_{46}, f_{47}, f_{48}, f_{49}, f_{50}, f_{51}, f_{52}, f_{53}, f_{54}, f_{55}, f_{56}, f_{57}, f_{58}, f_{59}, f_{60}, f_{61}, f_{62}, f_{63}, f_{64}, f_{65}, f_{66}, f_{67}, f_{68}, f_{69}, f_{70}, f_{71}, f_{72}, f_{73}, f_{74}, f_{75}, f_{76}, f_{77}, f_{78}, f_{79}, f_{80}, f_{81}, f_{82}, f_{83}, f_{84}, f_{85}, f_{86}, f_{87}, f_{88}, f_{89}, f_{90}, f_{91}, f_{92}, f_{93}, f_{94}, f_{95}, f_{96}, f_{97}, f_{98}, f_{99}, f_{100}\} \end{aligned}$$

57112-50125 57125 1 50 11 11150. 1115 111 5650. 1111

For a discriminating few, the new book, *Photography and the American Scene*, by Alfred Stieglitz, is a revelation. You are made aware of how the camera has changed the way we see the world, and how it has changed the way we see ourselves. The book is a collection of photographs by Stieglitz, taken between 1905 and 1915, and it is a masterpiece of photography. It is a book that should be read by everyone who is interested in photography, and it is a book that should be read by everyone who is interested in the American scene.



11/21/2014 11:54

*Around the World
in 6 Months*

THE
A. A. SUTTON
CORPORATION
NEW YORK

Forward of an

Master in the Geography—It went for you."

In San Francisco



300 Rooms
from \$3 - Single &
from \$5 - Double &

* you are
welcome
* at *
the HOTEL
WHITCOMB

Kuril E. Vlasov: *Professor of Mathematics at Moscow State University.*

U. S. NAVY SHIP'S CLOCK
Seth Thomas
and Chelsea



8-Day-Grand New
Luminous Dial
11 Jewels

995

[illegible]

JOHN B. CRAWFORD, INC.

163 *Published Online* 9 June 2006

60000 100000

Received 20 October 2004; accepted 12 November 2004



What a difference from their daughters!

From middle schoolers' "I can't believe news!" Then, a basketball team—all right, in the past generation. More, in fact, than you might suspect. Even today, these Green's grown taller than a basketball center on the basketball team!

Today's average college girl is a stunner and a lot over the size of her grandmothers. That's what the "American Athletic" at Yassar, Smith and Barnard shows. And the University of California reports the same result in its own research.

This doesn't mean we're raising "fat" women. The average height in America is still going up. But it does mean younger girls like better foods to grow on.

Most of them are developed at National Dairy Laboratories—for the very good reason that dairy products are the perfect food for growing girls. And the new rules of modern nutritional research.

Fortunately, National Dairy is equipped

to turn the findings of your research into the reality of new foods. The efforts of a great team of experts are combined to bring you better foods—and more of them—than you ever dreamed of when you were a girl.

Developed by the experts and put to use, the products of these products are based on the latest research as a base for the development of new products and methods... as a result of the research, our progress on the farms and in the home and cities of America.



These brands assure you of highest quality

NATIONAL DAIRY
PRODUCTS CORPORATION



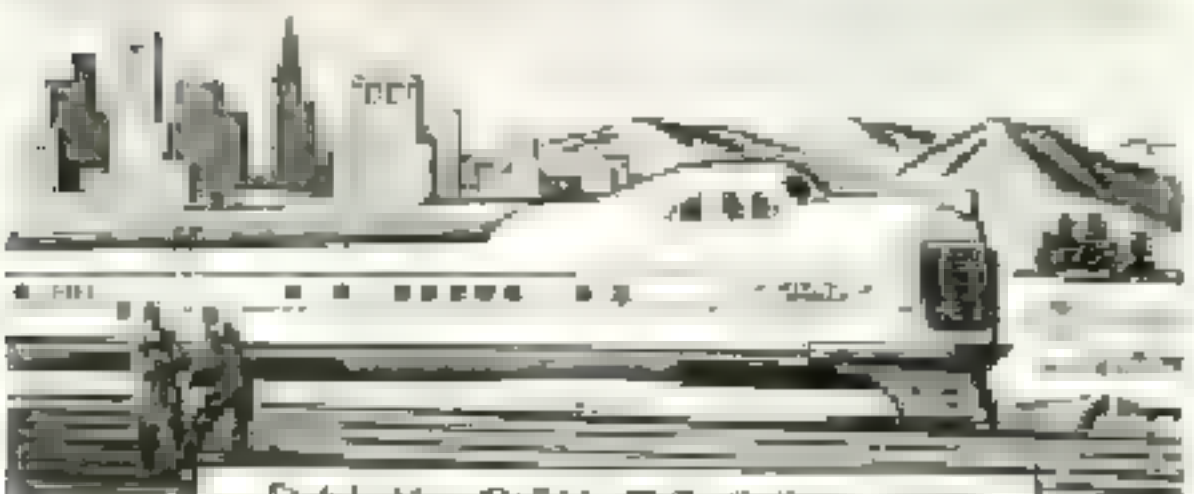
DAILY CITY OF LOS ANGELES



DAILY CITY OF ST. LOUIS



DAILY CITY OF PORTLAND



DAILY CITY OF DENVER



CITY OF SAN FRANCISCO

**UNION PACIFIC
RAILROAD**



The Famous Fleet of Union Pacific *"Cities" Streamliners*

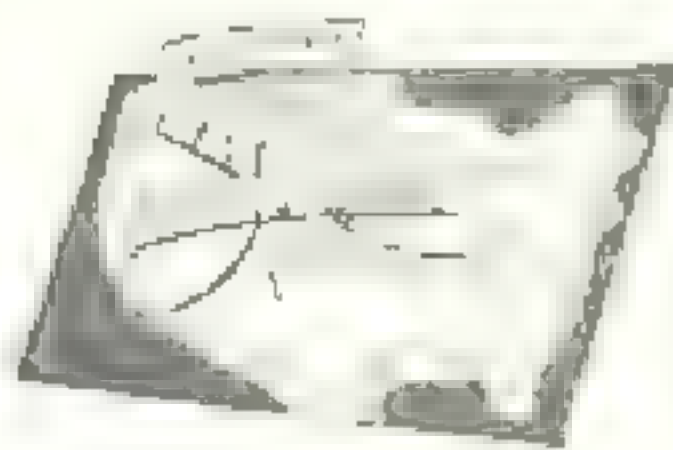
It's convenient... it's restful...
it's smart to travel on Union
Pacific's sleek time saving "Cities"
streamliners.

From the time you step aboard,
a world of comfort is at your
service. Air conditioning provides
cool air. Rest room, dining car
and observation car make your
trip so easy to your destination.
Nothing to worry about. You're
completely relaxed by the time
you arrive.

* * *

For the smoothest possible
streamlined travel, get the good
old "Union Pacific".

For further information, contact Stream-
lined Information Service, Union Pacific
Streamlined Division, 1000
Union Pacific Building, Room 1000,
Denver, Colorado.



EVER SHOOT A BEAR?



Here's your chance! They'll pose for you while you "shoot" your camera. Their playground—and yours—is Yellowstone National Park, a wonderland of boiling geysers and snow-capped mountains, a wilderness equipped with fine hotels. Vacationing at Yellowstone is inexpensive! Example: \$11.31 buys a 7-day North ern Pacific round trip from Chicago—including all transportation, and hotels and meals within the Park. What kind of transportation? ...



You ride in luxury in a new Northern Pacific streamlined coach, drawn by a smooth new diesel locomotive. "Next door," fine food is cooking in the NP diner. Back in the new coach buffet-lounge car, there's good company. Rather sleep? Your chair almost becomes a bed when you tilt it back and pull down the leg rest. You'll enjoy traveling along the Main Street of the Northwest... where new equipment has joined old-time western hospitality.

FOR TRAVEL INFORMATION, write E. E. Nelson, 914
Northern Pacific Building, St. Paul 1, Minn.



SAFETY

*for
your
travel
funds*

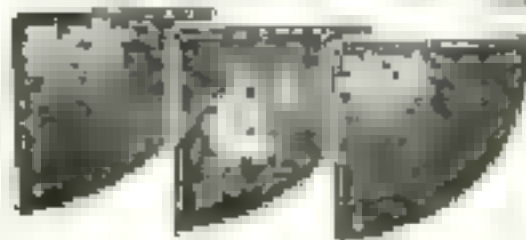


AMERICAN EXPRESS
Travelers Cheques

- ✓ Sales thru cash
 - ✓ Promptly refunded a lost or stolen
 - ✓ Speculable anywhere
 - ✓ Good until used
 - ✓ No identification needed except your signature
 - ✓ Cost only 75¢ per \$100 (\$50 or less 40¢)
- SOLD AT BANKS, PRINCIPAL RAILWAY
EXPRESS AND WESTERN UNION OFFICES**

YOU'LL PRIZE
these genuine leather
BOOKMARKS

MARK MARKS



5/24/04
10:00 AM

Bind Your Geographies for Lasting Reference Use



1. The first step in the process of the investigation is the identification of the problem. This is done by the investigator who is responsible for the study. The next step is to collect data. This is done by the investigator who is responsible for the study. The next step is to analyze the data. This is done by the investigator who is responsible for the study. The next step is to interpret the data. This is done by the investigator who is responsible for the study. The next step is to report the results. This is done by the investigator who is responsible for the study.

Bound to Please

THE ALBRECHT COMPANY
BALTIMORE, MD.



RCA Communications' new world-wide automatic tape relay radio system speeds Radiograms.

New wings for words around the world!

Radiograms "World-A" jump from over a pound to an impressive 1500 gram weight, and their wheels speed your messages. From New York, London, San Francisco, or Manila, they reach you.

This advanced technique in international radiotelegraphy is the result of wartime research and development. It gives you private messages that come speed, accuracy and dependability which were unheard of before. It is the result of U. S. Army Communications Service during the war.

RCA Radiograms—some of the

world's fastest means of radio and electronic communication, is presently and increasingly being committed to service to the National Government.

When you buy an RCA Victor Radiogram telephone receiver, Victor Radiogram gramophone, or phonograph record, you are getting thanks to RCA research and engineering, one of the finest products of its kind in the world.

For more information, contact the RCA Victor Corp., New York, N. Y., or RCA Victor Sales Representative, 151 Eastern Boulevard, Long Beach, Calif.



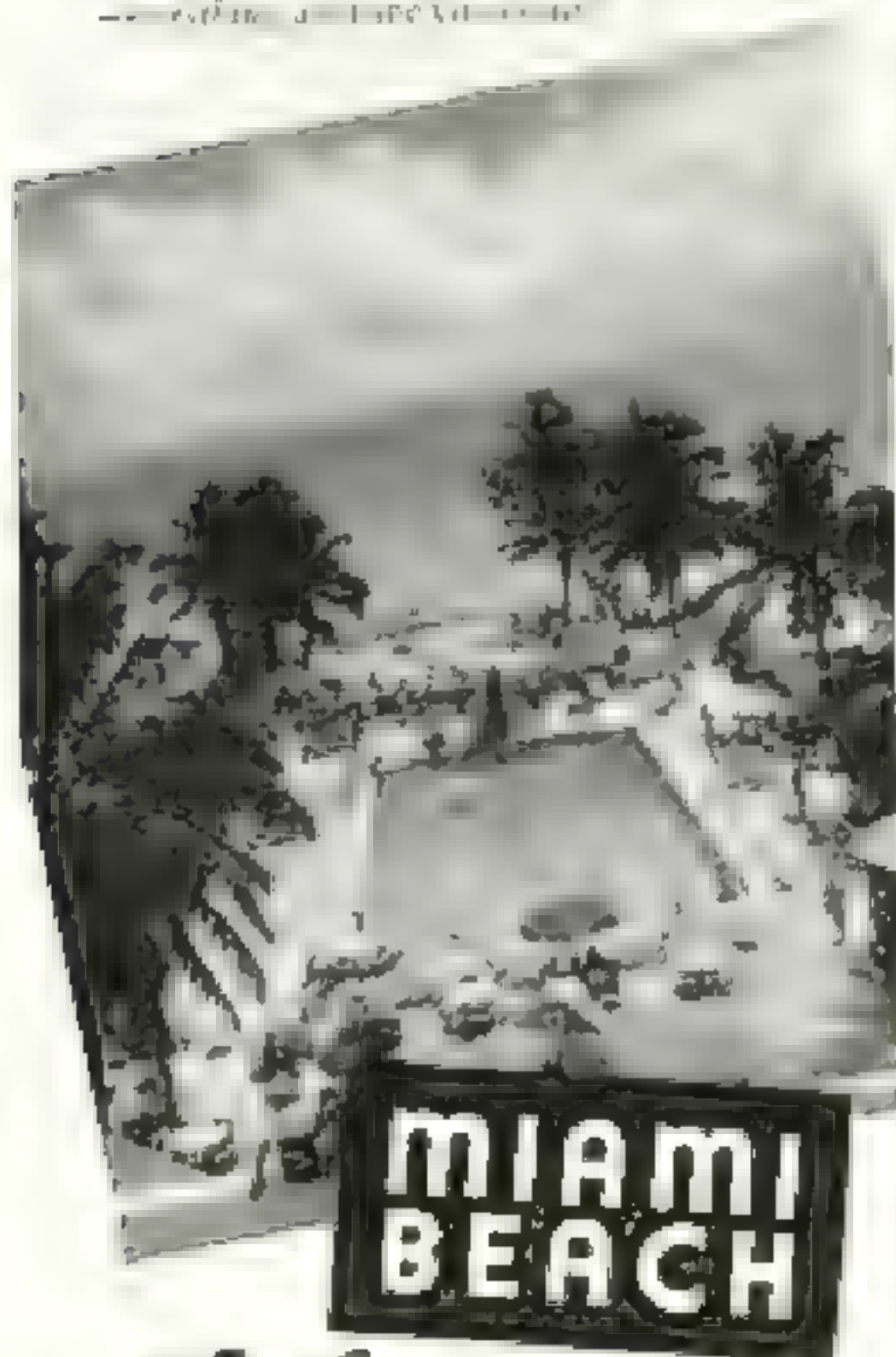
At RCA Communications, you can have the world's fastest and most accurate means of communication. You can have the world's fastest and most accurate means of communication. You can have the world's fastest and most accurate means of communication.



RADIO CORPORATION of AMERICA

OF
JUNE ~~18~~ JANUARY...

That night, Miami Beach is
 remembered now—"Miami
 Beach has restaurants for
 all occasions—and buy one
 with the good, clean, safe
 food, gifts, shoes, clothes
 and many other things to
 make a life of it.



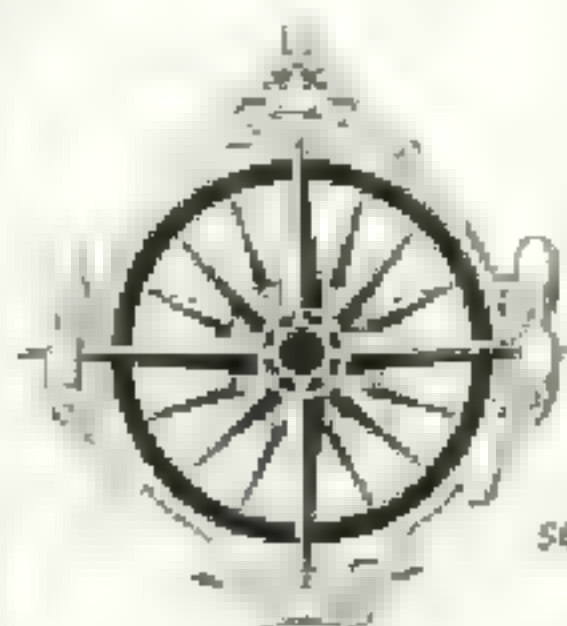
The weather man says
it will be a hot day
and the sun will be
out for most of the
day.

[illegible]

Write Department D, Marine
Teach Chamber at 4000 Avenue
for new color film - see page 10

THESE OFFICIALS WILL
[REDACTED] [REDACTED] [REDACTED] [REDACTED]

ANNOUNCING
a new
National Geographic Book



How the
map-making
riddles of
the ages are
solved by today's
cartographers

THE ROUND
EARTH
ON FLAT PAPER

It is for this reason that the Commission has decided to launch a study on the impact of the proposed changes on the environment. The study will be carried out by the Commission's own experts and by independent experts. The results of the study will be made available to the public.

[illegible]

13. The respondent failed to provide the requested information for the following reasons:

It is important to note that the values of α and β are not independent. In fact, α and β are related by the equation $\alpha + \beta = 1$. This is because the total probability of the system being in either state is 1. The values of α and β are determined by the initial conditions of the system. For example, if the system starts in state 1, then $\alpha = 1$ and $\beta = 0$. If the system starts in state 2, then $\alpha = 0$ and $\beta = 1$. In general, the values of α and β are determined by the initial state of the system.

$$\text{Na}^+ + \text{UO}_2^{2+} + \text{UO}_2(\text{OH})_2 + \text{H}_2\text{O} \rightleftharpoons \text{NaUO}_2(\text{OH})_2 + 2\text{H}^+$$

$$1.8 \times 10^{-11} \quad \text{UO}_2(\text{OH})_2 + \text{H}_2\text{O} \rightleftharpoons \text{UO}_2(\text{OH})_2 + \text{H}^+ \quad 1.8 \times 10^{-11}$$

A black and white photograph of a small, ornate wooden cabinet, possibly a jewelry box or a small safe. The cabinet has two doors, both of which are open. The left door is open to the left, and the right door is open to the right. The interior of the cabinet shows several shelves and a small drawer. On top of the cabinet, there is a vase containing several reeds or dried grasses. The cabinet has a decorative lattice pattern on the inside of the right door. The overall style is traditional and elegant.




Figure 1

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

Abstract

2' ne ...



100 ENVELOPES

Printed
with special process
color inks.

\$700
retiree

The American Stationery, Note, and Envelope Co. has just received and put on hand a stock of envelopes, you can select from envelopes about 1000 envelopes, printed with name and address, only 25¢. The printed address envelopes cost more. We can supply you with best paper and envelopes, as well as binding. The envelopes are made at the American Stationery Co., New York, with the best of paper and envelopes, and are of the highest quality. If you are interested, write to the American Stationery Co., New York, and we will send you a sample of the envelopes.

THE AMERICAN STATISTICAL ASSOCIATION
120 PARK AVENUE, NEW YORK, N. Y.

THE

THE MICHIGAN
STATE UNIVERSITY LIBRARY

**AMERICAN
STATIONERY**

for NATIONAL GEOGRAPHIC
Maps and Map Indexes:



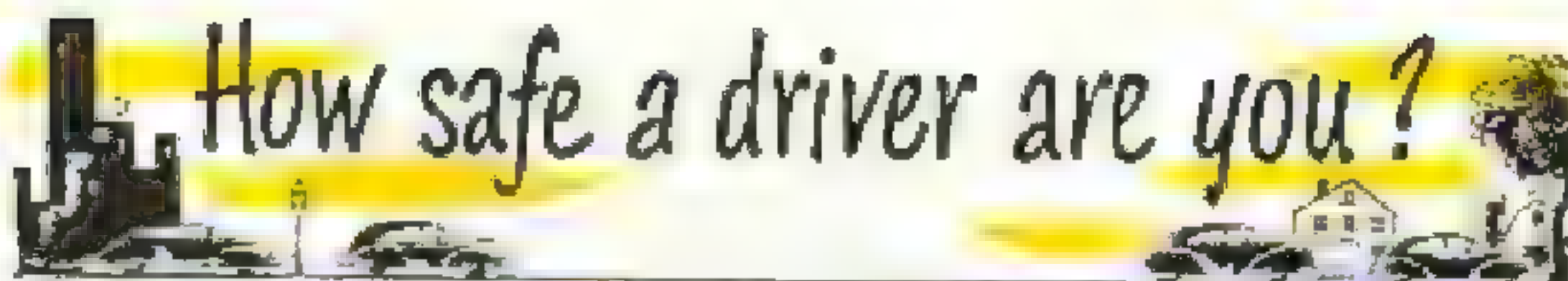
THE UNIVERSITY OF MICHIGAN LIBRARY

[illegible]

NAME: [REDACTED] DATE: [REDACTED]
 TOPIC: [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]

NATIONAL GEOGRAPHIC SOCIETY

-DEPT. OF P. WASHINGTON D. C.==



Are your driving habits good habits?

Driving can be a pleasure or a nuisance or both. It depends on how you drive. If you must stop habit to keep your mind on your driving, to keep your car under control, and to observe traffic rules, you'll get more pleasure from your motoring. You'll get places just as fast as careless motorists, and you'll have a better chance of avoiding accidents.

Make it a habit, too, to keep your car in good condition. Brakes, steering mechanism, lights, and tires should be checked regularly.



When you have to stop can you do it in time?

Cars are not really stopped as quickly as you think you can. At 20 miles an hour, your car will go at least 21 feet while you move your foot from the accelerator to the brake. Under the best conditions, it will take another 21 feet or a total of 43 feet—before you stop.

This stopping distance increases with your speed. At 40 miles an hour it is 43 feet, and at 60 miles an hour you'll travel 65 feet before you can stop. The National Safety Council is responsible for these figures.



How should you drive at night?

Driving in the dark requires special care, for you can't see very far ahead.

If your headlights show a barrier 150 feet ahead and you're driving 50 miles an hour, you are *outrunning* your headlights, for at that speed you can't stop in less than 155 feet.

Try to avoid looking directly at approaching headlights. Lower your own lighting don't take the chance that a "light-blinded" motorist will run into you. Watch your side of the road for pedestrians or parked cars.



How can you help avoid accidents?

It's only sensible to adjust your driving to adverse weather and road conditions.

Be prepared for emergencies such as blow-outs or sudden skids, and know what to do when they occur. Keep alert for the attention of other drivers or pedestrians.

And remember—a survey reported by the National Safety Council shows that drivers who have been drinking are 3 to 4 times as likely to be involved in an accident as those who haven't.

To help you get more pleasure from your motoring, send for Metropolitan's free booklet, 77-N, on safe driving.

Metropolitan Life Insurance Company

120 WALL STREET
NEW YORK 6, N.Y.



TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE KEEP IT!



Demon Trap

THESE are the things that tell of an old-time superstition that have led to the death of many a poor fellow.

A hunter is getting that evil spirit, and he is going to set the horse on fire, because so the other disaster is avoided, he has to be careful.

Some people are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

Some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

Some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

Some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

Some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

Some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

Some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit, and some are afraid of the evil spirit.

MORAL INSURE IN

The Travelers

ALL FORMS OF INSURANCE AND SURETY BONDS

The Travelers Insurance Company, The Travelers Indemnity Company, The Travelers Fire Insurance Company, The Travelers Life Insurance Company, Hartford, Connecticut.

It's **SPAM** wick time!



Have a **SPAM** party

The easy fun-way to entertain, with Laze Susan doing all the work. Simply stack the trays with thin slices of tender mild, delicious Spam and let guests devise their own Spam-wiches, helped by cheese, relish, lettuce, mayonnaise, pickles, butter, white and red.



COLD OR HOT

SPAM HITS THE SPOT!

"SPAM" is a registered trademark. It identifies a pure pork product — packed only in 12-ounce cans — made exclusively by Gen. A. Hormel & Co., Austin, Minn.

HORMEL

GOOD FOOD

Kodak

Make Movies in Color

Cine-Kodak movies tell the whole story
...step by step...in thrilling color

Real stories from real life—complete with action, color, and better—always with color—
movies on full-color Kodak movie film tell the whole story.

With Cine-Kodak, movies are as easy as snap-
shots—outdoors in sunlight or shade, indoors
on any inexpensive Photoflashes. Depend on it—
your very first movies will be good movies.

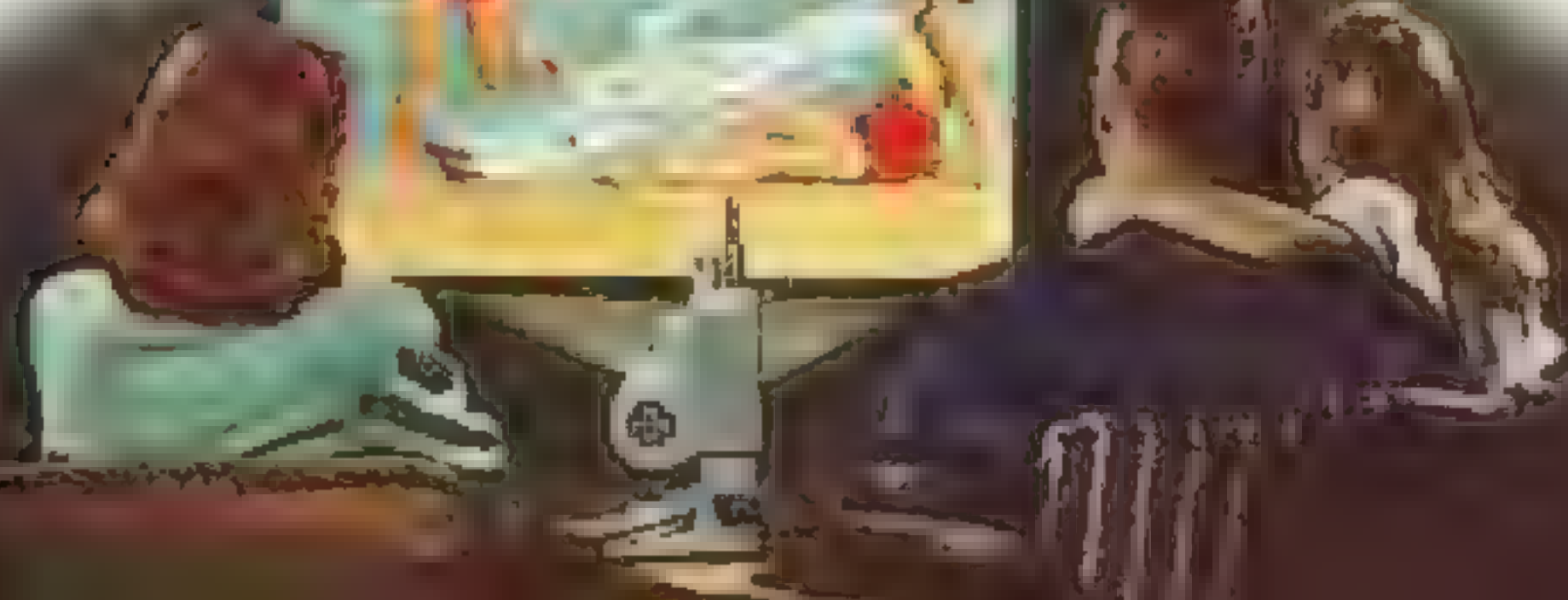
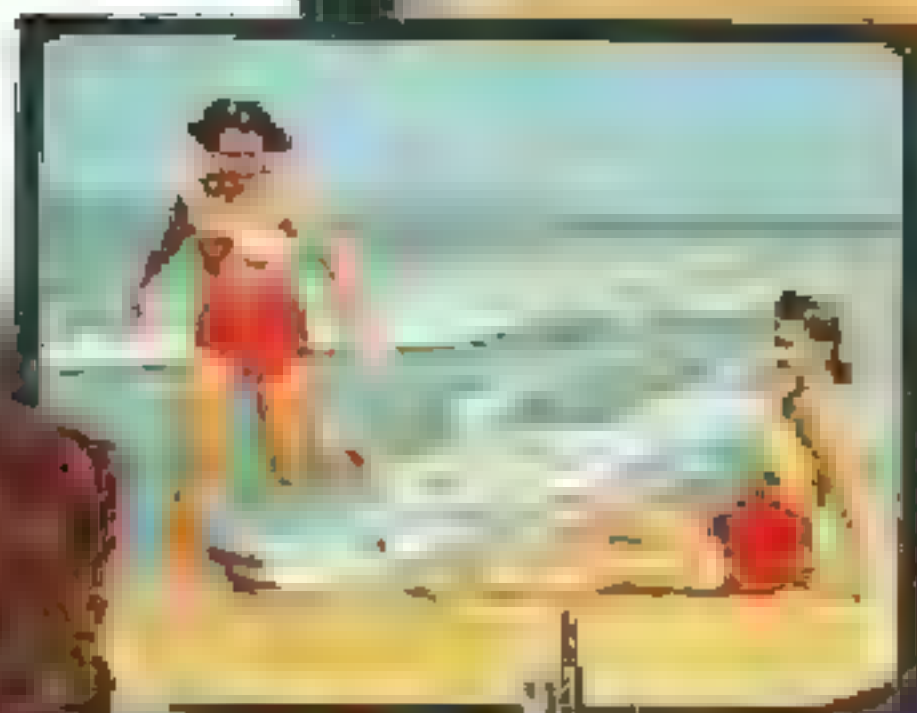
Kodak is making movie cameras, projectors,
and turn them over to you—but the demand
is greater. For see your dealer—and ask for
the true booklet, *How to Make the Most of
Kodak Film*.



Kodak's Complete Movie Service

All Kodak sound and developed to work
together. Cine-Kodak is a complete
package for home movie making.
Cine-Kodak film, processed with our
exclusive Cine-Kodak lab-developing
and Kodak's own, the projector
that shows your movie on the
big screen.

For more Kodak Company,
Rochester, N. Y.



KNOW YOUR WORLD

National Geographic Society
Dept. D-P, Washington, D. C. _____ 1947
Please send it down the address below:

Standard size type
prints on either paper or
Litho. *Indicates items
also for 30x40 marked
with asterisk. All items
are sent postage prepaid.

[illegible][illegible][illegible]

DATE: 11/11/1971 BY: J. L. H. 11/11/1971

New Market Company Corporation	
Month	Price per
January	25c
February	25c
March	25c
April	25c
May	25c
June	25c
July	25c
August	25c
September	25c
October	25c
November	25c
December	25c

John A. Lander
 Under Secretary
 The World
 No. 1000, 10th Street
 Washington, D. C.
 U. S. A.

Name _____

Address _____

Use National Geographic's Timely, Ten-color Maps

WFH IS INSURED by a major insurance company for fire and theft, and the company also provides maps to show you the location of the club with reference to the police station. Because the National Automobile Security Association is not a national police association, I have written to the club to ask for a copy of the police map. The club has agreed to provide a copy of the map for the police. It also has agreed to provide a copy of the map for the police. It also has agreed to provide a copy of the map for the police.

Map Indexes: Available for maps marked with an asterisk (*) in the adjoining table. Each map is available in maps of corresponding region and designations.

Map File: The handy 7 1/4 x 10 3/4-inch file is used like a book, preserves maps for instant use. Ten pockets can hold 20 or less paper maps or a collection of 10 folded maps. Includes index.

Enlarged Maps

[illegible]

United States--67" x 43 1/2": A color photograph mounted in a black album. The photograph shows a man in a suit and tie, standing in front of a building. The man is looking towards the camera. The building has a sign that reads "United States". The photograph is mounted on a black album page.

[illegible]

No. & So. Hemispheres - 67" x 35 1/2"
Hand-drawn map of the world showing the continents and oceans. The map is oriented with North at the top. The title "No. & So. Hemispheres" is written at the top. The map shows the outlines of the continents and the names of the oceans. The map is drawn on a rectangular piece of paper.

Printers & Presses: order in copy for separate pages "U. S. & Foreign" and "Homeborn." Remittance should be payable to U. S. J. Co. All items sent postage prepaid.

Obtainable only from the NATIONAL GEOGRAPHIC SOCIETY, Dept. D-F, Washington, D. C.

FALSE TEETH WEARERS



NO BRUSHING



**DON'T BRUSH
DELICATE*
PLATES!**

*Soak them in Polident to keep them
clean, bright, sweet!*

"False teeth require special care. You can't brush them like natural teeth, and brushing them with food particles and bacteria is a sure way to get rid of them. And brushing them with toothpaste will only make them look worse. That's why Polident is the only safe, effective way to keep your false teeth clean and bright. It's the only way to keep them looking like the real thing. That's why Polident is the only way to keep your false teeth looking like the real thing. That's why Polident is the only way to keep your false teeth looking like the real thing."

Soak your plates in Polident. A Polident bath is easy to make. Just mix one part Polident with four parts water. Soak your plates for 15 minutes every day. And every 15 minutes is recommended by dentists. It's the only way to keep your false teeth looking like the real thing. That's why Polident is the only way to keep your false teeth looking like the real thing."

IT'S EASY! IT'S QUICK!

And there's no need to brush with a toothbrush. Just soak your plates in Polident. That's all it takes. That's all it takes. That's all it takes."

Use **POLIDENT** Daily TO KEEP PLATES AND BRIDGES
CLEAN... AND ODOR-FREE!



Colleges for Women

CHRISTIAN COLLEGE

1200 N. 1st St., Chicago, Ill.
C. Miller, Ph.D., Pres., Box 2, Columbus, Mo.

LINDENWOOD COLLEGE

1500 N. 1st St., St. Louis, Mo.
President, Box 247, St. Charles, Mo.

Coed Colleges

COE COLLEGE

1000 N. 1st St., Cedar Rapids, Iowa.
President, Box 247, St. Charles, Mo.

RUTLAND JUNIOR COLLEGE

1000 N. 1st St., Rutland, Vt.
President, Box 247, St. Charles, Mo.

Girls' Schools

ASHLEY HALL

1000 N. 1st St., Ashley, N.C.
President, Box 247, St. Charles, Mo.

AVERETT

1000 N. 1st St., Averett, Va.
President, Box 247, St. Charles, Mo.

CHAPEL HILL SCHOOL

1000 N. 1st St., Chapel Hill, N.C.
President, Box 247, St. Charles, Mo.

DEAN JUNIOR COLLEGE

1000 N. 1st St., Dean, Mass.
President, Box 247, St. Charles, Mo.

EDGEWOOD PARK

1000 N. 1st St., Edgewood Park, N.Y.
President, Box 247, St. Charles, Mo.

FAIRFAX HALL

1000 N. 1st St., Fairfax Hall, Va.
President, Box 247, St. Charles, Mo.

GREENBRIER COLLEGE

1000 N. 1st St., Greenbrier, W. Va.
President, Box 247, St. Charles, Mo.

GRIER SCHOOL

1000 N. 1st St., Grier, Pa.
President, Box 247, St. Charles, Mo.

KINGSWOOD-CRANBROOK

1000 N. 1st St., Kingswood-Cranbrook, Mass.
President, Box 247, St. Charles, Mo.

THE KNOX SCHOOL

1000 N. 1st St., The Knox School, N.Y.
President, Box 247, St. Charles, Mo.

LASELL JUNIOR COLLEGE

1000 N. 1st St., Lasell Junior College, Mass.
President, Box 247, St. Charles, Mo.

LINDEN HALL

1000 N. 1st St., Linden Hall, Pa.
President, Box 247, St. Charles, Mo.

OAK GROVE

1000 N. 1st St., Oak Grove, Maine.
President, Box 247, St. Charles, Mo.

OGONTZ JUNIOR COLLEGE

1000 N. 1st St., Ogontz Junior College, Pa.
President, Box 247, St. Charles, Mo.

PERRY KINDERGARTEN NORMAL

1000 N. 1st St., Perry Kindergarten Normal, Mass.
President, Box 247, St. Charles, Mo.

RYDAL HALL

1000 N. 1st St., Rydal Hall, Pa.
President, Box 247, St. Charles, Mo.

SAINT MARY'S HALL

1000 N. 1st St., Saint Mary's Hall, Minn.
President, Box 247, St. Charles, Mo.

WALNUT HILL

1000 N. 1st St., Walnut Hill, Mass.
President, Box 247, St. Charles, Mo.

WARRENTON COUNTRY SCHOOL

1000 N. 1st St., Warrenton Country School, Va.
President, Box 247, St. Charles, Mo.

Coed Schools

DEAN ACADEMY

1000 N. 1st St., Dean Academy, Mass.
President, Box 247, St. Charles, Mo.

MERRICOURT

1000 N. 1st St., Merricourt, Conn.
President, Box 247, St. Charles, Mo.

OAKWOOD FRIENDS SCHOOL

1000 N. 1st St., Oakwood Friends School, N.Y.
President, Box 247, St. Charles, Mo.

WAYLAND ACADEMY

1000 N. 1st St., Wayland Academy, Mass.
President, Box 247, St. Charles, Mo.

Vocational

Bryant COLLEGE

1000 N. 1st St., Bryant College, R.I.
President, Box 247, St. Charles, Mo.

KATHARINE GIBBS

1000 N. 1st St., Katharine Gibbs, Pa.
President, Box 247, St. Charles, Mo.

Home Study

1000 N. 1st St., Home Study, Pa.
President, Box 247, St. Charles, Mo.

1000 N. 1st St., Home Study, Pa.
President, Box 247, St. Charles, Mo.

TRI-STATE COLLEGE

1000 N. 1st St., Tri-State College, Ind.
President, Box 247, St. Charles, Mo.

Home Study

SCHOOL-AT-HOME

1000 N. 1st St., School-At-Home, Pa.
President, Box 247, St. Charles, Mo.

1000 N. 1st St., School-At-Home, Pa.
President, Box 247, St. Charles, Mo.

CALVERT SCHOOL

1000 N. 1st St., Calvert School, Md.
President, Box 247, St. Charles, Mo.

Boys' Schools

ADIRONDACK-FLORIDA

1000 N. 1st St., Adirondack-Florida, N.Y.
President, Box 247, St. Charles, Mo.

ADMIRAL BILLARD ACADEMY

1000 N. 1st St., Admiral Billard Academy, Conn.
President, Box 247, St. Charles, Mo.

ADMIRAL FARRAGUT ACADEMY

1000 N. 1st St., Admiral Farragut Academy, Conn.
President, Box 247, St. Charles, Mo.

THE BAYLOR SCHOOL

1000 N. 1st St., The Baylor School, Tenn.
President, Box 247, St. Charles, Mo.

RANDOLPH-MACON MILITARY ACADEMY 8th Year. At northern entrance to Skyline Drive. Prepared for college through intensive study methods. Finest of buildings. Limited capacity. Write for catalog. Col. John C. Beggs, Prin., Box E, Front Royal, Va.

RIVERSIDE

MILITARY ACADEMY

FULLY ACCREDITED preparation for all colleges, Junior College. Outstanding record. Highest official War Dept. rating. 3rd ROTC. Separate school for younger boys. INDEPENDENCE emphasizes the superior facilities of two complete school plants and the individual attention of faculty officers who live in same buildings and eat at same tables with cadets. BOYS AND PARENTS appreciate the varied activities and well rounded program, the small classes, the weekly reports, and the fine instruction at this distinguished school. HEALTH, interest and development secured by spending January, February and March at Highlands-by-the-Sea, Florida. International and all-inclusive annual ball. Complete illustrated catalog on request.

GENERAL SANDY BEAVER, Pres.

WINTER IN FLORIDA Box 107 N. Calhounville, Georgia

FALL & SPRING IN BLUE RIDGE MOUNTAINS

ROOSEVELT MILITARY ACADEMY "Discipline of Men." Military Staff of World War II Officers. Fully Accredited. High School, Jr. School. Outstanding Guidance Dept. Ages 10-18. All sports. Riding. Moderate rate. Catalog. Col. Glen D. Milikan, Box C, Alledo, Ill.

SAINT LEO COLLEGE PREPARATORY



ACADEMIC. Superior college preparation. Boys 10-17. Small classes. Supervised study. Ideal climate. 160-acre campus. Private lake. Sports. Modern equipment. Gym. Est. 1889. Near Tampa. Catalog. Rev. Father Raphael, Box N, Saint Leo, Florida.

ST. JOHN'S MILITARY ACADEMY Intensive military discipline helps develop confidence, leadership. Grades 8-12. Balanced program of conference study, education. Accredited Sports. 8th year. SUMMIT Mountain. Catalog. 1377 DeKoven Hall, Delafield, Wis.

SAINT THOMAS MILITARY ACADEMY

MILITARY training combined with superior college preparation in Catholic environment. Individual guidance. Pool, gym. Sports. Boarding. Day. Catalog. Very Rev. V. J. Flynn, Box 2, St. Paul, Minn.

SHATTUCK SCHOOL

PARIBOLLY, Minnesota. Founded 1858. Best college prep. Master-student ratio 1:3. ROTC. Reports. Science program. School golf program. Frisbees, lacrosse, skis, water polo. Chess. Band. Summer-Richard Camp. Donald Henning, D.D., Rector, 475 Shattuck.

STAUNTON MILITARY ACADEMY

★ Distinguished for excellent academic, military and athletic training. Highest War Dept. Rating. In historic Shenandoah Valley of Virginia. High altitude. Unsurpassed health record. War Dept. R.O.T.C. Unit. Separate Junior School. Early enrollment desirable. Catalog. Superintendent, Box D-7, Staunton, Virginia.



STONY BROOK ACCREDITED DEPARTMENT (including) thorough grounding in mathematics, sciences, English, other fundamentals; physical fitness; distinctive Christian training. Grades seven to college. 45-acre campus, surrounded by trees. Address: Frank E. Gombalin, Litt.D., Box M, Stony Brook, Long Island, N. Y.

TENNESSEE MILITARY INSTITUTE

Prepares for the better colleges and technical schools. High academic and military standards, developed through 73 years, encourage good scholarship, develop fine character traits. R. O. T. C. Grades 8-12. Athletics for all. 144 acres. Restricted to 200 boys. Catalog. Col. C. R. Easley, Sup., Box 147, Sweetwater, Tenn.

TEXAS ★ MILITARY COLLEGE

• HIGH SCHOOL AND JR. COLLEGE.
• SMALL CLASSES: INDIVIDUAL ATTENTION.
• NIGHTLY TUTORING BY QUALIFIED INSTRUCTORS.
• ATHLETICS FOR ALL.
Catalog and Yearbook on request.
SUPERINTENDENT, 20 STONEWALL JACKSON ROAD, TERRELL, TEXAS

TODD SCHOOL AND CAMP

Days 8 to 20. 19th year. Accredited individual College Preparation. Study helps. Creative Application from Aviation to Journalism. Friendly environment. Biking. Hour from Chicago. Catalog. Roger Hill, Prin., Box B, Woodstock, Illinois.

"At the Nation's Stride"
VALLEY FORGE Military Academy
Valley Forge graduates are leaders in peace as they were in War. Col. Fred B. J. Hill, June 1926. Small progressive classes; guidance and tutoring between teaching staff. Unsurpassed faculty. All round sports, swimming. Intensive education for all. Special emphasis on body building. 30 modern, heated buildings. Summer Field Academy. Catalog. Dr. B. G. T. Hill, Catalog. Box M, Wayne, Pa.

WENTWORTH MILITARY ACADEMY 8th yr. Jr. High School. Separate 2 year College. Senior ROTC. C.A. & Firing. An accredited. Heart of America. Large Gym. Indoor pool. All sports. Riding. Mariemont Country Club. Summer School. Catalog. Col. J. M. Sellers, 877 Wash. Place, Lexington, Ma.

WESTERN MILITARY ACADEMY

Basic accredited training program for any college. Grades 8-12. Best taught how to study. Personal attention. ROTC. Highest gov't rating. Sports. Biking. Pool, gym. 6th yr. Near St. Louis. Catalog. Col. R. L. Jackson, Pres., Box N-7, Alton, Ill.

WORCESTER ACADEMY

INTERNATIONALLY KNOWN prep. school for boys. Est. 1881. Sound preparation for college and for life. Well integrated physical education program. LeRoy A. Campbello, Ph.D., Headmaster, 95 Providence Street, Worcester 4, Mass.

* DUES: Annual membership in United States, \$4.00; Canada, \$5.00; abroad, \$1.00. Life membership, \$100 U. S. funds. Remittances should be payable to National Geographic Society. Remittances from outside of continental United States and Canada should be made by New York draft or international money order.

RECOMMENDATION FOR MEMBERSHIP

IN THE

NATIONAL GEOGRAPHIC SOCIETY

* The Membership Dues, Which Are for the Calendar Year, Include Subscription to the National Geographic Magazine

PLEASE FILL IN BLANKS BELOW. DETACH, AND MAIL TO THE SECRETARY

1947

To the Secretary, National Geographic Society,
Sixteenth and M Streets Northwest, Washington 6, D. C.:

I nominate _____

Occupation _____

(This information is important for the records)

Address _____

for membership in The Society.



HUBBARD CASKETS of STAINLESS STEEL

ASSURANCE of protection against the effects of time -- a significant feature of every Hubbard Stainless Steel Casket.



Featured by leading Funeral Directors everywhere.

HUBBARD CASKET COMPANY
San Diego, California
Pioneer Manufacturer of Stainless Steel Caskets



A BATTERY OF MULTICOLOR PRESSES

Judd & Detweiler, Inc.
Established in 1900

Printers

EDDINGTON PLACE AND FLORIDA AVENUE
WASHINGTON, D. C.

THIS MAGAZINE IS OUR ENDORSEMENT

**NATIONAL
GEOGRAPHIC**

Publications of unusual interest

ILLUSTRATED IN FULL COLOR

The Grandeur That Was Rome: Ancient Rome at the height of its glory is portrayed in this 90-page booklet reprinted from the November, 1946, NATIONAL GEOGRAPHIC. It features 32 paintings in full color, by H. M. Herget, depicting Roman life and customs. A page of descriptive text accompanies each painting. Two articles, 26 other illustrations, and a two-page map are also included in this companion booklet to "Classic Greece and the Aegean." 75¢ in U. S. and Poss. Elsewhere, 85¢.

Classic Greece & the Aegean: 128-page reprint from March and May, 1944, NATIONAL GEOGRAPHIC. Features 32 color paintings with descriptive text reconstructing life in Ancient Greece; 16 photographs in color, 40 in monochrome; three articles; two maps. Indispensable to students and teachers. 75¢ in U. S. and Poss. Elsewhere, 85¢.

Insignia & Decorations of U. S. Armed Forces: 2,476 full-color reproductions and 159 monochrome photographs illustrate this 208-page presentation of the insignia, decorations, medals, service ribbons, and badges of the men and women in our armed forces and other official organizations that participated in the war effort. Invaluable for identifying rank, services, war decorations. \$1 in U. S. and Poss. Elsewhere, \$1.25.

Cattle of the World: An authoritative story of the origin, history, and economic place of cattle, with informative descriptions of domesticated and wild varieties in many lands; 45 subjects in full-color paintings and 94 monochrome engravings illustrate the significant breeds. Mulberry cloth binding; 142 pages; 7 x 10 inches. \$1.50 in U. S. and Poss. Elsewhere, \$1.75.

Available only from the National Geographic Society.
Remittance in U. S. funds should accompany order.
All items sent postpaid.

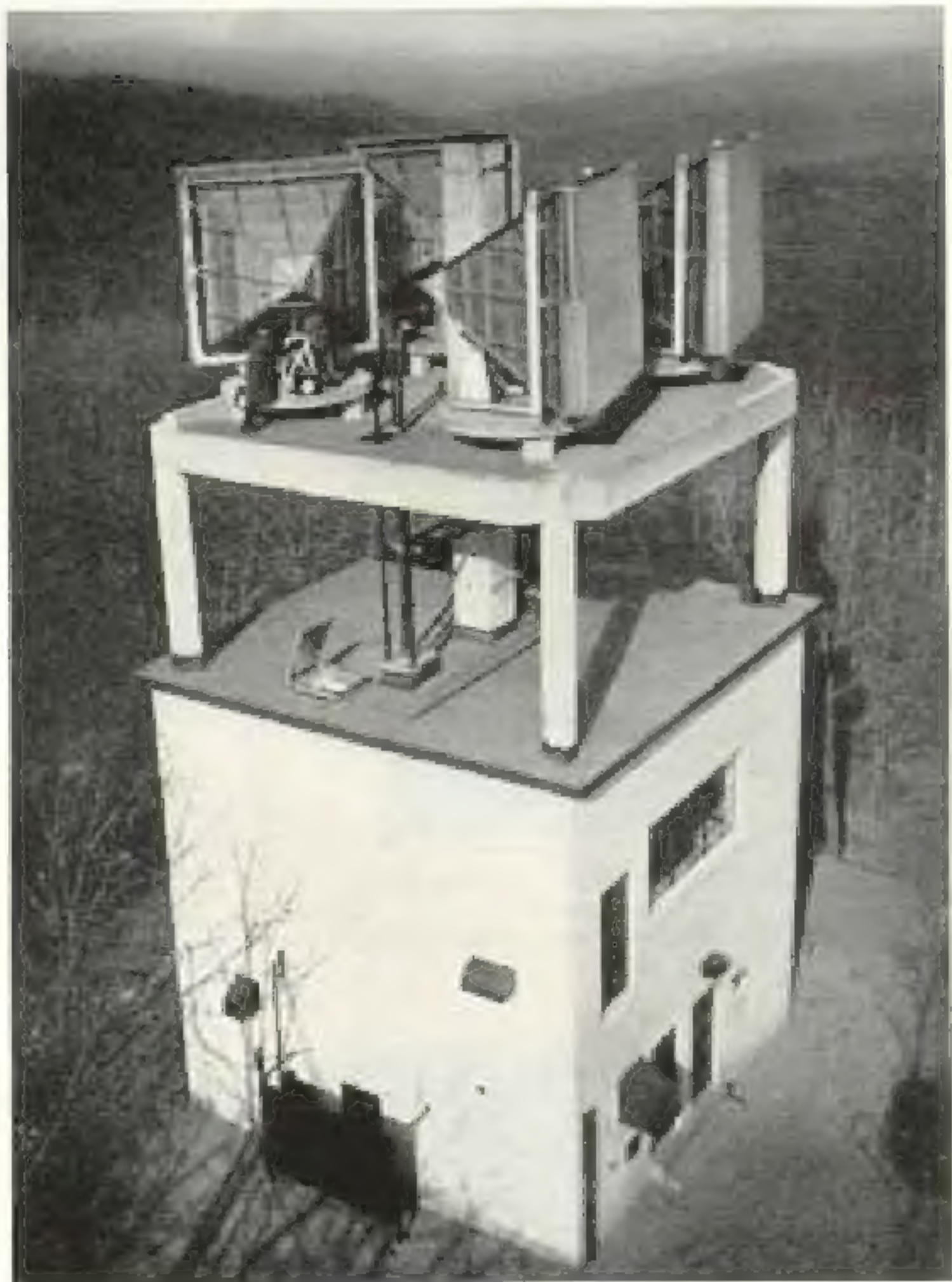
National Geographic Society
Dept. D-P, Washington 6, D. C. 1947

Please send me the items indicated below:

NAME OF BOOK	Price Each		Copies Desired
	U. S. & Poss.	Elsewhere	
The Grandeur That Was Rome	\$0.75	\$0.85	
Classic Greece and the Aegean	.75	.85	
Insignia and Decorations	1.00	1.25	
Cattle of the World	1.50	1.75	

I enclose remittance of \$..... payable in U. S. funds.
(WRITE NAME AND ADDRESS IN MARGIN BELOW)

Seven towers on seven hilltops



One of seven relay stations — to test use of radio "microwaves" for Long Distance calls.

Built by the Bell System, they will provide a new kind of Long Distance communication.

Each hilltop tower is a relay station between New York and Boston* for very short radio waves. These "microwaves" are free from static and most man-made interference. But they shoot off into space instead of following the earth's curve. So they have to be gathered into a beam and aimed at the next tower, about 30 miles

away. That's the job of the four big, square, metal lenses on each tower. They focus microwaves very much as a magnifying glass focuses the sun's rays.

These radio relay systems may be used for Long Distance telephone calls and to transmit pictures, radio broadcasts and television programs.

This is another example of the Bell System's effort to provide more and better Long Distance service.

BELL TELEPHONE SYSTEM



*We have applied to the Federal Communications Commission for authority to start a similar link here between New York and Chicago.

Nothing could be finer



THE LINCOLN CONTINENTAL CABRIOLET

When available, white glow-in-the-dark line at extra cost.

Lincoln

DIVISION OF FORD MOTOR COMPANY